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FOOD TECHNOLOGY ABSTRACTS

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**National Information Centre For Food Science And Technology
Central Food Technological Research Institute,
Mysore - 570 013, India**

ABBREVIATIONS

A	ampere
AAS	atomic absorption Spectrometry
abstr.	abstract
ad lib.	ad libitum
ADP	adenosine diphosphate
Anon.	Anonymous
AOAC	Association of Official Analytical Chemists
approx.	approximately
atm	atmosphere
ATP	adenosine triphosphate
a _w	water activity
BHA	butylated hydroxyanisole
BHT	butylated hydroxytoluene
BOD	biological oxygen demand
b.p.	boiling point
Btu	British thermal unit
c-	centi- [as in cm, cm ² , cm ³]
cal	calorie
cd	candela
Ci	curie
CMC	carboxymethyl cellulose
COD	chemical oxygen demand
coeff.	coefficient
conc.	concentrated
concn.	concentration
cv.	cultivar
cwt	hundredweight
d-	deci-
DE	dextrose equivalent
detn.	determination
DFD	dark firm dry
diam.	diameter
dil.	dilute
DM	dry matter, Deutsche Mark
DNA	deoxyribonucleic acid(s)
dyn	dyne
E.	East, Eastern, etc
ECD.	electron capture detection
EDTA	ethylenediaminetetra acetic acid
Eh	oxidation-reduction potential
ELISA	enzyme-linked immunosorbent assay
f-	femto-[10 ⁻¹⁵ , as in fCi]
°F	degree Fahrenheit
FAO	Food and Agricultural Organization
FDA	Food and Drug Administration
FID	flame ionization detection
fl oz	fluid ounce
f.p.	freezing point
ft	foot, feet

g	gram
GC	gas chromatography
gn	gravity
gal	gallon
gf	gram-force
GLC	gas-liquid chromatography
h	hour
ha	hectare
HDPE	high density polyethylene
hl	hectolitre [100 l]
hp	horse power
HPLC	high performance/pressure liquid chromatography
HTST	high temperature short time
Hz	hertz [frequency cycle/s]
in	inch
IR	infrared
IU	international unit
J	joule
k-	kilo- [as in kcal, kg]
K	Kelvin
l	litre
lb	pound
lb	pound-force
LDPE	low density polyethylene
m-	milli- [as in mg, ml, mm]
m-equiv	milli-equivalent
m	molar concentration
M-	mega- [as in Mrad]
max.	maximum
min	minute [time]
min.	minimum
mol	mole
mol.wt	.molecular weight
m.p.	melting point
MPN	most probable number
MS	mass-spectrometry
n-	nano-[10 ⁻⁹ , as in nm]
N	Newton [kg m/s ²]
N.	North, Northern, normal concentration
NMR	nuclear magnetic resonance
NPU	net protein utilization
oz	ounce
p-	pico- [10 ⁻¹² , as in pCi]
P	poise
P	probability
Pa	Pascal [N/m ²]
PAGE	polyacrylamide gel electrophoresis
PER	protein efficiency ratio
p.p.b.	parts per billion
p.p.m.	parts per million
PSE	pale soft exudative
PTFE	polytetrafluorethylene
PVC	polyvinyl chloride
PVDC	polyvinylidene chloride

qt	quart
R	roastgen
rad	rad or radian
ref.	reference(s)
rev/min	revolutions per minute
RH	relative humidity
RNA	ribonucleic acid(s)
S.	south, Southern, etc.
s.d.	standard deviation
SDS	sodium dedecylsulphate
s.e.	standard error
s	second [time]
SNF	solids-not-fat
sp., spp.	species
sp.gr.	specific gravity
summ.	summary
Suppl.	Supplement
t	metric tonne
temp.	temperature
TLC	thin layer chromatography
TS	total solids
UHT	ultra-high temperature
UV	ultraviolet
V	volt
var.	variety
vol.	volume
v/v	volume/volume
w	watt
W.	West, Western, etc.
WHO	World Health Organization
w/v	weight/volume
wk	week
wt.	weight
yd	yard
yr	year
μ	micro-[as in g, m]
%:	per centum
>	greater than
≥	greater than or equal to;
	not less than
<	less than
≤	less than or equal to;
	not greater than

Chemical symbols are used for all elements

ABBREVIATIONS FOR LANGUAGES

Language of text

Dutch	Nl
French	Fr
German	De
Italian	It
Japanese	Ja
Norwegian	No
spanish	Es
swedish	Sv

JOURNALS SCANNED FOR FTA

ASEAN Food Journal	CRC Critical Reviews in Microbiology	Food Sciences and Nutrition
ASHRAE Journal	CRC Critical Reviews in Toxicology	Food Technology
Acta Alimentaria	CSIRO Food Research Quarterly	Food Technology in Australia
Acta Alimentaria Polonica	Cafe-Cocoa-The	Food Technology in New Zealand
Activities Report	Cajanus	Food Trade Review
Agricultural Engineering	Canadian Entomologist	Food and Chemical Toxicology
Agricultural Situation in India	Canadian Institute of Food Science and Technology	Food and Cookery Review
American Journal of Botany	Journal	Food and Cosmetics Toxicology
American Journal of Enology and Viticulture	Canadian Journal of Animal Science	Food and Nutrition
American Scientist	Canadian Journal of Microbiology	Food and Nutrition Bulletin
Anales de Bromatologia	Cereal Chemistry	Food and Nutrition, Notes and Reviews
Analyst (London)	Cereal Foods World	Food from Poland
Andhra Agricultural Journal	Chemical Age of India	Food in Canada
Annals of Botany	Chemical Senses	Fruits
Annals of Tropical Research	Chemie Mikrobiologie Technologie der Lebensmittel	Getreide-Mehl und Brot
Applied Microbiology and Biotechnology	Chemistry and Industry	Gordian
Applied and Environmental Microbiology	Chemistry in Britain	Grasas y Aceites
Appropriate Technology	Coffee & Cocoa International	Hortscience
Archives of Environmental Contamination and Toxicology	Confectionery Production	IFST Proceedings
Archives of Toxicology	Confructa	ISI Bulletin
Archivos Latinoamericanos de Nutricion	Cuban Journal of Agricultural Science	Indian Arecanut, Spices and Cocoa Journal
Arogya	Current Research	Indian Baker
Australian Journal of Agricultural Research	Current Science	Indian Cashew Journal
Australian Journal of Dairy Technology	Dairy and Food Sanitation	Indian Cocoa, Arecanut & Spices Journal
Australian Journal of Plant Physiology	Defence Science Journal	Indian Coconut Journal
Baker's Digest	Deutsche Lebensmittel-Rundschau	Indian Coffee
Baking Today	Die Nahrung	Indian Dairyman
Bangladesh Journal of Scientific and Industrial Research	Ecology of Food and Nutrition	Indian Farming
Baroda Journal of Nutrition	Economic Botany	Indian Food Industry
Beverage and Food World	Egyptian Journal of Food Science	Indian Food Packer
Bioscience	Energy Digest	Indian Horticulture
Biotechnology	Environmental Health	Indian Journal of Agricultural Economics
Biotechnology and Bioengineering	Ernahrungsforschung	Indian Journal of Agricultural Sciences
Biotechnology Progress	Experimental Agriculture	Indian Journal of Animal Health
Brewer's Digest	FAT Science Technology	Indian Journal of Animal Research
British Food Journal	Fishery Technology	Indian Journal of Animal Science
British Journal of Nutrition	Flour Milling and Baking Research Association Bulletin	Indian Journal of Biochemistry and Biophysics
British Poultry Science	Fluessiges Obst	Indian Journal of Dairy Science
Bulletin of Entomological Research	Food	Indian Journal of Environmental Health
Bulletin of Environmental Contamination and Toxicology	Food Australia	Indian Journal of Experimental Biology
Bulletin of Grain Technology	Food Biotechnology	Indian Journal of Fisheries
Bulletin of Sciences	Food Chemistry	Indian Journal of Horticulture
Bulletin of World Health Organization	Food Drug Cosmetic Law Journal	Indian Journal of Meat Science and Technology
Bulletin of the Japanese Society of Scientific Fisheries	Food Engineering International	Indian Journal of Medical Research
CRC Critical Reviews in Analytical Chemistry	Food Hydrocolloids	Indian Journal of Medical Sciences
CRC Critical Reviews in Biotechnology	Food Irradiation Information	Indian Journal of Microbiology
CRC Critical Reviews in Environmental Control	Food Manufacture	Indian Journal of Nutrition and Dietetics
CRC Critical Reviews in Food Science and Nutrition	Food Microbiology	Indian Journal of Poultry Science
	Food Microstructure	Indian Journal of Public Health
	Food Processing Industry	Indian Journal of Technology
	Food Product Development	Indian Miller
	Food Production/Management	
	Food Research Institute Studies (USA)	
	Food Reviews International	
	Food Science and Technology Today	

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 INFORM
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 International Journal of Refrigeration
 International Pest Control
 International Rice Research Newsletter
 International Sugar Journal
 Invention Intelligence
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 Proceedings of the Indian Academy of Science, Section A
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 Punjab Horticultural Journal
 Qualitas Plantarum - Plants Foods for Human Nutrition
 Quick Frozen Foods
 Quick Frozen Foods International
 Report of the National Food Research Institute (Japan)

Research and Industry, India	Seed Science and Technology	Tropical Grain Legume Bulletin
Revista de Agroquímica Y Tecnología de Alimentos	Seeds and Farms	Tropical Pest Management
Rice Journal	Solar Energy	Tropical Stored Products Information
Riechstoffe Aromen Kosmetica	Soybean Digest	Two and a bud
Science (USA)	Starch/Starke	VarFoda
Science Reporter	Swedish Journal of Agricultural Research	Voeding
Science and Culture	Tea and Coffee Trade Journal	World Coffee and Tea
Sciences	Technical Quarterly, Master Brewers Association of America	World Crops
Sciences Des Aliments	Technology Review	World Health
Scientific American	Toxicology	World's Poultry Science Journal
Scientific World	Tropical Agriculture	Zeitschrift Fuer Lebensmittel-Untersch und Forschung
Seafood Export Journal		

CONTENTS

	Page No
General	... 1
Food Processing	... -
Food Packaging	... 1
Food Engineering and Equipment	... 2
Energy in Food Processing	... 3
Food Chemistry and Analysis	... 3
Food Microbiology and Hygiene	... 4
Biotechnology	... 5
Tissue Culture	... -
Food Additives	... 5
Cereals	... 6
Millets	... 7
Pulses	... 9
Oilseeds and Nuts	... 10
Tubers and Vegetables	... 11
Fruits	... 14
Confectionery, Starch and Sugar	... 16
Bakery products	... 17
Milk and Dairy products	... 18
Meat and Poultry	... 24
Seafoods	... 31
Protein Foods	... 33
Alcoholic and Non-alcoholic Beverages	... 33
Fats and oils	... 34
Spices and Condiments	... 35
Sensory Evaluation	... 37
Food Storage	... 37
Infestation Control and Pesticides	... 37
Biochemistry and Nutrition	... 39
Toxicology	... 41
Food Laws and Regulations	... -
Author Index	... 43
Subject Index	... 51

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GENERAL

1

Dennis (C). **Processing to provide consistent quality for the consumer.** *Indian Food Industry* 9(4): 1990; 20-23, 27

The concept of healthy eating, convenience in using food products, originality in products, environmental issues, food preservative technology and quality, the requirements for safe and quality food, hazard analysis critical control point (HACCP) concept, good manufacturing practices, are briefly highlighted in this article. SRA

FOOD PROCESSING

Nil

FOOD PACKAGING

2

Talati (JD) and Gandhi (DK). **Corrosion of zinc in citric acid containing food colourants.** *Indian Journal of Technology* 29(6): 1991; 277-282

The corrosion of Zn by citric acid with added tartrazic, Ponceau 4R, Amaranth, Carmoisine, Sunset yellow and Fast Red E has been studied. An increase in the concn. of colourant increases the corrosion, the order of corrosivity in 0.033 M citric acid containing 0.1% of colourant being: tartrazic less than or equal to Amaranth < Sunset yellow less than or equal to Ponceau 4R < Fast Red E < Carmoisine. The degree of protection (P.I.) or acceleration (-P.I.) due to the colourants has been calculated on a % basis. The effect of acid concn. on the pH and specific conductivity of the solution and wt. loss due to corrosion at 30 C, showed that the pH of the acid decreased from 2.65 for 0.0033 M to 1.5 for 0.33 M citric acid. The wt. loss due to corrosion and the specific conductivity increased with increase in acid concn. Zn in 0.033 M citric acid showed a corrosion potential of -980 mV vs SCE. In presence of 0.0004 M colourant, the potential either remains unaltered or decreases slightly. Galvanostatic polarization curves show very little anodic but appreciable cathodic polarization of all colourants. SRA

3

Veerraju (P) and Rangarao (GCP). **Food packaging in India: A perspective.** *Indian Food Industry* 9(6): 1990; 14-22

Various aspects of food packaging like techno-economical trends, (metal containers, glass, plastics, aseptic packaging, retort pouches, modified controlled atm. packaging, other significant trends), constraints in the Indian context, demand pattern for packaging materials and forms in the next five yrs and development measures are covered. SRA

4

Rangarao (GCP). **All that matter that matters in food package labelling.** *Indian Food Industry* 9(6): 1990; 28-36

Labelling laws applicable to packaged foods, SWMA, PFA, FPO, MFPO, Agmark rules, status of current labelling practices and lacuna are the aspects covered in this article. BV

5

Subramanian (MR). **Packaging of food.** *Packaging India* 32(2): 1990; 5-7

In food packaging consideration should be given for packaging food in primary form and in processed form. The main points to be considered in food packaging are chemical and physical features of food, nature of packaging needed and economics. Authors also stresses the need for considering the market forces. The author gives a list of packaging equipments needed and elaborates how these could be used in packing different products. KAR

6

Chatterjea (BD). **Emerging trends in food packaging.** *Packaging India* 21(5): 1989; 17-21

This article highlights the advances made in the field of direct/primary packaging (foods and beverages). Covers trends in food packaging, first phase - 1960-1972, second phase - 1973-1980, third phase - 1980 onwards, new packaging developments (PET bottles, controlled atmosphere packaging, aseptic brick filling, barrier film packaging, retortable package, dual ovenable trays), future outlook, materials and structures, Indian scene - food packaging, machinery, processing and packaging, economics of plastics in food packaging, and standards. SRA

7

Nagaraj (P). **Packing of agro-horticultural produce and marine products in stand-up pouches.** *Packaging India* 21(5): 1989; 28-30

Covers flexible packaging, stand-up pouch concept, package requirements, packaging material, unit wt.

of packages 50 - 500 g. packaging of agro-horticultural produce, marine products, retort pouches and export in stand-up-pouches. SRA

Aseptic packaging

8

Astrom (A). **Aseptic packaging.** *Indian Food Industry* 9(6): 1990: 23-27, 39

Development from paper containers for milk and juice to thermoplastics for prepared food, can systems, carton systems, bulk systems are the aspects covered in this article. SRA

FOOD ENGINEERING AND EQUIPMENT

9

Kapil (V), Dodeja (AK) and Sarma (SC). **Heat transfer during concentration of whey in thin film scraped surface heat exchanger.** *Journal of Food Science and Technology (India)* 28(5): 1991: 267-270

Thermal performance of thin film scraped surface heat exchanger was evaluated for concentrating deproteinized paneer whey to high solids with process variables such as mass flow rate, steam temp., rotor speed, number of blades, etc. Appropriate correlation was developed in the form of box Wilson Model to predict overall heat transfer coeff. The effect of process variables on overall heat transfer coeff. is discussed. AS

10

Bangs (WE) and Reineccius (GA). **Prediction of flavour retention during spray drying: An empirical approach.** *Journal of Food Science* 55(6): 1990: 1683-1685

A rapid, semi-quantitative prediction model was developed for retention of volatile organic flavouring compounds during spray drying. Nonequilibrium vapour phase flux and effective (liquid phase) diffusion coeff. of lemon oil and/or butanol isomers (n-, sec-, tert-) correlated with spray dryer retention. Prediction of retention of these compounds was dependent on the specific sample matrix and dryer. AS

11

Sadeghi (F) and Swartzel (KR). **Time-temperature equivalence of discrete particles during thermal processing.** *Journal of Food Science* 55(6): 1990: 1696-1698, 1739

A method is developed to determine time-temp. equivalencies within discrete particle during thermal processing. Encapsulated calibration materials were examined for establishing the equivalent point for a canning process where results were in good agreement with thermal evaluations using Ecklund thermocouple data. Process characteristics for continuous flow, as Reynolds number, Nusselt number, residence time distribution within heat exchangers and holding tubes, and size and shape of particles are considered for expanding the use of the methodology. AS

12

Thakur (BR), Trehan (IR) and Arya (SS). **Radiolytic degradation of sorbic acid in isolated systems.** *Journal of Food Science* 55(6): 1990: 1699-1702, 1710

Radiolytic degradation of sorbic acid (SA) decreased with rise in pH, sugar, hydrocolloids except pectin, citric acid, lactic acid, malic acid, arginine and threonine, catalysed degradation while oxalic acid, maleic acid, Cu^{2+} , nitrite, nitrate and phthalate showed protective effects. SA was more stable in alcohols and vegetable oils than in aqueous solutions. In wheat flour radiolytic degradation of SA was less at lower moisture. Relatively SA was more stable in chapathies than in dough. Gelatination and addition of oil in dough reduced degradation of SA. BV

13

Dutta (B) and Sastry (SK). **Velocity distributions of food particle suspensions in holding tube flow: Distribution characteristics and fastest-particle velocities.** *Journal of Food Science* 55(6): 1990: 1703-1710

Velocity distributions of model food particles were investigated by videotaping particles suspended in sodium carboxymethylcellulose (CMC) solutions during passage through a transparent holding tube similar in dimension to that of commercial aseptic processing systems. The distributions could be well described by log-normal models. Fastest particle velocities were below theoretical centerline velocities for Newtonian fluids but were above theoretical values for the fluids used. Results indicated that for particle concn. levels used in these studies, channeling and particle-fluid interaction effects may be significant. AS

14

Succar (J) and Hayakawa (K-I). **A method to determine initial freezing point of foods.** *Journal of Food Science* 55(6): 1990: 1711-1713

An accurate initial freezing point T_{sh} is required for reliable analysis of a food freezing or thawing process. Two previous formulae for accurately estimating enthalpies, one for temp. above T_{sh} and another below T_{sh} , were used for this development. The estimation of T_{sh} was based on the mathematical formulation of continuity in food enthalpies estimated by both formulae at T_{sh} . The method was validated by estimating T_{sh} values of aqueous solutions of sucrose and NaCl at different solutions. There was fair agreement in the T_{sh} values of fresh fruit and vegetables, lean beef meat and lean fish meat estimated by the proposed and a previous method. One potential advantage of the new method was the direct estimation of T_{sh} through analysis of food enthalpies collected at different temp. AS

15

Mcguire (J), Al-Malah (K), Bodyfelt (FW) and Gamroth (MJ). **Application of ellipsometry to evaluate surface cleaning effectiveness.** *Journal of Food Science* 55(6); 1990; 1749-1750, 1752

The usefulness of ellipsometry for characterizing milk soils on fouled surfaces as well as those remaining on cleaned surfaces is reported. Application of the technique to rate efficiency of different cleaning methods with respect to their ability to remove milk soils from various materials is detailed. BV

16

Adams (JB). **Enzyme inactivation during heat processing of food-stuffs.** *International Journal of Food Science and Technology* 26(1); 1991; 1-20

Aspects discussed in this review are enzyme inactivation on heating (structural and thermodynamic considerations, degradation of primary structure, non-covalent structure stabilization, substrate interactions and prosthetic groups and kinetics of inactivation), mathematical modelling of enzyme inactivation in heated foods, relationship between enzyme activity and quality (flavour-related enzymes (lipase, lipoxygenase and superoxide dismutase) colour-related enzymes, texture-related enzymes (amylases, pectin-degrading enzymes, pectinesterase, pectate hydrolase (polygalacturonase), protease and peroxidase activity and quality). 95 references. BV

17

Stekelenburg (FK) and Labots (H). **Measurement of water activity with an electric hygrometer.** *International Journal of Food Science and Technology* 26(1); 1991; 111-116

This investigation focuses on the specific problems in the use of an electric hygrometer, and in particular, the equilibration period, the calibration of the sensors and the influence of temp. on the measurements in meat products. The instrument proved to be a simple, rapid and reliable means of measuring water activity values, provided some precautions are taken. BV

ENERGY IN FOOD PROCESSING

18

NPC Energy Management Division. **Energy conservation potential in distilleries.** *Productivity* 31(2); 1990; 313-314

19

Rizzi (G) and Sharma (VK). **Solar drying technology for agricultural products in developing countries - 2: Solar dryers and their applicability to agricultural products.** *Invention Intelligence* 25(4); 1990; 166-173

FOOD CHEMISTRY AND ANALYSIS

20

Latreille (B) and Paquin (P). **Evaluation of emulsion stability by centrifugation with conductivity measurements.** *Journal of Food Science* 55(6); 1990; 1666-1668, 1672

An industry problem when evaluating stability of emulsions is lack of a method reproducing, in a short time, aging of the emulsion. A method that combines centrifugation and conductivity measurements could be used for this purpose. Centrifugation accelerates destabilization of the product and thus simulates aging. Conductivity measurement of the aqueous phase, a function of the oil concn., evaluates destabilization. The method was compared with a creaming-measurement method based on fat content. The increase in conductivity was representative of the creaming rate, with correlation higher than 0.93. The combined method, applies to different oil-in-water (O/W) emulsions, enables following stability during aging and assures the need of industry for a fast, easy method to evaluate emulsion stability. AS

21

Chang (Y-I) and Reineccius (GA). **Interaction of β -cyclodextrin with enantiomers of limonene and carvone.** *Journal of Food Science* 55(6); 1990; 1686-1688, 1695

The inclusion complexes of β -cyclodextrin with two pairs of chiral flavour compounds, limonene and carvone, were used to evaluate the chiral interaction. Thermal transition was examined by DSC and crystalline properties by x-ray diffractometry. The overall DSC thermograms and X-ray diffraction patterns were very similar between the chiral isomers. A difference of about 3 joules/g complex was observed between the chiral isomers of both limonene and carvone. The only apparent difference in X-ray diffraction patterns between chiral complexes occurred at a θ of 11.8° . AS

FOOD MICROBIOLOGY AND HYGIENE

Enzymes

Papain

22

Arteaga (GE) and Nakai (S). **Tetrathionate protects proteolytic activity of simulated papaya latex and crude papain.** *Journal of Food Science* 55(6); 1990; 1728-1731

The addition of sodium tetrathionate (STT, 1%) significantly reduced the loss of proteolytic activity (PA) of rehydrated crude papain after being oven dried at 55 C. Addition of 1% sodium metabisulphite also protected PA during oven drying; however its protective effect was significantly lower than that of STT. Results suggest TT may decrease loss of PA during papaya latex processing and storage of crude papain. BV

Proteases

23

Pannu (DS) and Mathur (MP). **Partial purification and characterisation of active protease from *Withania coagulans*.** *Indian Journal of Dairy Science* 43(1); 1990; 81-85

Plant protease from *Withania coagulans* could be obtained with 7.68 fold purification and having MCA:PA ratio of 0.059. The proteolytic nature of the plant protease was demonstrated by its higher proteolytic activity at different stages of purification.

The optimum pH and temp. of the milk clotting enzyme was observed to be 5.5 to 6.0 and 45 C resp. A substrate concn. of 12% skim milk powder was found to be suitable for the coagulating activity. A direct correlation of milk clotting activity with the enzyme concn. was observed. The optimum concn. of CaCl_2 was found to be 10nM. The max. activation of the enzyme was shown by Zn^{2+} whereas boric acid exhibited the min. inhibition. AS

Ethyl alcohol

24

Chen (HC). **Non-aseptic, multi-stage, multi-feeding continuous fermentation of cane molasses to ethanol.** *Process Biochemistry* 25(3); 1990; 87-92

In a single-stage CSTR, the high ethanol concn. in the reactor reduced rates of yeast growth and product formation, and the system was prone to infections. These observation led to the development of a multi-stage, multi-feeding, CSTR system for continuous fermentation of cane molasses to ethanol. The productivities obtained from a three-stage ($5.41 \text{ gl}^{-1} \text{ h}^{-1}$) and a five-stage ($6.21 \text{ gl}^{-1} \text{ h}^{-1}$) systems were significantly higher than a single-stage ($4.69 \text{ gl}^{-1} \text{ h}^{-1}$) system. The five-stage system was scaled up about 100 times in a pilot-plant, where effluent ethanol concn., overall volumetric productivity and total sugar conversion yield averaged 8.54% (v/v), $5.35 \text{ gl}^{-1} \text{ h}^{-1}$ and 81.3%, resp. In addition to higher productivity, the successfully continuous fermentation of non-aseptic cane molasses for more than a month without any pretreatment except partial acidification was the major breakthrough of this multi-stage continuous process. AS

Fermentation

25

Mizutani (S). **The development of aroma components by microbial fermentation.** *Perfumer and Flavourist* 15(5); 1990; 21-25

Covers microorganisms of the food industry, screening and usage of aromatic substance producing microorganisms and the conversion of aroma precursors by microorganisms. BV

Fermented foods

Idli

26

Sowbhagya (CM), Pagaria (LK) and Bhattacharya (KR). **Effect of variety, parboiling and aging of rice on the texture of Idli.** *Journal of Food Science and Technology (India)* 28(5); 1991; 274-279

Of the 16 var. of rice, representing 8 different cooking quality types, those having 22% amylose or more, either raw or parboiled were suitable for the preparation of Idli and gave the desired soft and spongy texture. Low amylose and waxy rice yielded hard and sticky textured Idli. Sensory analysis corroborated with the results of objective tests. Idlis from aged rice had better appearance and texture compared to fresh rice Idlis. AS

Microorganisms

Algae

27

Dembitsky (VM), Rozentsvet (OA) and Pechenkina (EE). **Glycolipids, phospholipids and fatty acids of brown algae species.** *Phytochemistry* 29(11); 1990; 3417-3421

The fatty acid comp. of brown algae from the Black Sea was examined. It was demonstrated that their main fatty acids were 16:0, 18:1, 18:3, 18:4 and 20:5. Examination of the glycolipid comp. showed that monoglycosyldiacylglycerol content varied from 26.8 to 46.5% of total glycolipids, diglycosyldiacylglycerol content from 19.6 to 44.1% and sulphaquinovosyldiacylglycerol content from 17.5 to 51.7%. The proportion of general lipids in various species varied from 1.2 to 4.9% and that of phospholipids from 2.9 to 19.7%. Major phospholipids were phosphatidyl choline (PC), phosphatidyl glycerol (PG) and phosphatidyl ethanolamine (PE); however, some of them were found to contain PE, PG and phosphatidyl inositol as major phospholipids but no PC. Phosphorus-containing unidentified lipids were found in certain of the species examined. AS

Bacteria

Clostridium butyricum

28

Morton (RD), Scott (VN), Bernard (DT) and Wiley (RC). **Effect of heat and pH on toxigenic *Clostridium butyricum*.** *Journal of Food Science* 55(6); 1990; 1725-1727, 1739

This study indicates that toxigenic strains of *Clostridium butyricum* were considerably less heat resistant than the nontoxigenic strain tested. Toxigenic strains grew and produced toxin at pH 5.2 but not at pH 5.0. BV

Listeria monocytogenes

29

Buchanan (RL) and Klawitter (LA). **Effects of temperature and oxygen on the growth of *Listeria monocytogenes* at pH 4.5.** *Journal of Food Science* 55(6); 1990; 1754-1756

BIOTECHNOLOGY

30

Sharma (RP). **Role of biotechnology in meeting the future food demands.** *Indian Farming* 40(7); 1990; 11-15

31

Anon. **Biotechnology: A field of dreams for farmers, scientists and businessmen.** *Indian Farming* 40(7); 1990; 15-18

TISSUE CULTURE

Nil

FOOD ADDITIVES

32

Narasinga Rao (BS). **Food-additives - Consumers' view point.** *Indian Food Industry* 9(4); 1990; 14-17, 19

This article briefly covers the definition of food safety and food additives, contaminants and food additives, protection of the consumer-preventive approach, steps for pre-emptive action to prevent contamination hazard, the present food laws and their deficiencies, alternate improved system, National Food Safety Regulations (NFSR), National Food Safety Board (NFSB), food safety monitoring system and supporting analytical facility and the role of the consumer in safe guarding the safety of foods. SRA

33

Santhana Krishnan (T). **Current trends in the use of food additives in industry.** *Indian Food Industry* 9(4); 1990; 18-19

Colourants

Carthamin

34

Saito (K) and Fukushima (A). **Thermal stability of carthamin bound to insoluble polymers. Effects of pH and organic and inorganic compounds.** *International Journal of Food Science and Technology* 26(1); 1991; 21-26

Carthamin was adsorbed onto cellulose, cellulose derivatives, collagen and other polymers and the stability of the bound pigment examined as a function of buffer comp., pH, the presence of metal ions or organic compounds, temp. and pressure. Free carthamin was liable, especially in aqueous solutions, while bound carthamin remained stable when heated in an oven or retort for 1 h at 80 - 120 C at 1.0 - 2.1 atm. High buffer concn. was necessary for carthamin stability, but at high temp. and high pressure, stability greatly decreased in the presence of water. Metal ions or organic food ingredients had little effect. Basic conditions were also undesirable for preservation of the pigment on insoluble polymers. The results indicate that the bound carthamin has potential as a red-colouring agent for some processed foods. AS

Dye

Azo dyes

35

Sudhir Singh, Khanna (SK) and Mathur (BN). **Toxicological evaluation of permitted food colours. Part II. Azo dyes (Yellow).** *Indian Dalryman* 43(9); 1991; 403-406

Toxicological research carried out with sunset yellow FCF, tartrazine (c.i. Food yellow 4) have been described. The studies conducted include short and long term studies, carcinogenicity as observed by oral administration and sub-cutaneous/intraperitoneal administration of both the dyes. SRA

Stabilizers

Psyllium

36

Anon. **Psyllium stabilizer: Label friendly and functional.** *Prepared Foods* 159(9); 1990; 127

Sweeteners

37

O'Brien Nabors (L). **Intense sweeteners: Acesulfame K, alitame, aspartame, saccharin, sucralose.** *Manufacturing Confectioner* 70(11); 1990; 65-68

CEREALS

38

Singhee (KD). **The milling industry and its problems.** *Indian Food Industry* 9(3); 1990; 24-25

39

Panduranga Setty (MK). **Raw materials in milling and baking.** *Indian Food Industry* 9(3); 1990; 26-27, 32

Rice

40

Krishna Murthy (MM), Siva Rao (DV) and Ramasubbaiah (K). **Efficacy of carbofuran and certain other granular insecticides against insect pests of rice.** *Indian Journal of Entomology* 51(2); 1989; 200-204

The efficacy of 5 insecticides as granules was tested against the major insect pests of rice, namely, stem-borer, gall-roller and brown planthopper. Carbofuran at 1.0 kg a.i/ha gave full protection against all the four major pests and harvested the highest yield (5348 kg/ha in Kharif, 1978 and 5046 kg/ha in Rabi, 1979). Terbufos at 1.0 kg a.i/ha was effective only against stem-borer gall midge and brown planthopper while isoprocarb (1.0 kga.i/ha) was effective only against stem-borer and brown planthopper. All the 3 insecticides at 1.0 kg a.i/ha gave significantly higher yields over control and are comparable with the max. protection treatment. Three applications at 10, 30 and 60 days after planting were found to be necessary for controlling the pests at different stages of crop growth. AS

Triticale

41

Cessna (AJ). **The determination of residues of 2,4-D in post-emergence-treated triticale.** *Pesticide Science* 30(2); 1990; 141-147

A GC method, using electrolytic conductivity detection is presented for the detn. of 2,4-D as its methyl ester in triticale (*Triticosecale wittmack*) which is a man made cross between wheat (genus *Triticum*) and rye (genus *Secale*). The method was used to monitor the dissipation of 2,4-D residues in triticale over a growing season at two sites following post emergence application of the dimethylamine salt of 2,4-D at 0.56 kg ha⁻¹. Initial residues in the order of 30 mg kg⁻¹ on the day after application (3 to 4 leaf stage of the crop), decreased to non-detectable levels in the mature straw and seed. Recoveries of 2,4-D were greater than 90% from green tissue fortified at 0.1 mg kg⁻¹, and in the order of 75% from seed fortified at 0.05 mg kg⁻¹. The dissipation of 2,4-D in triticale was very similar to its dissipation in wheat. BV

Wheat

42

Sharma (A), Sharma (K) and Sarin (K). **Effect of different dosage of β -sitosterol on the biology of *Tribolium castaneum* (Herbst) and its comparison with that of different grades of resistance in selected wheat varieties.** *Indian Journal of Entomology* 50(3); 1988; 279-282

The effect of β -sitosterol doses equivalent to those present in resistant and susceptible wheat var. incorporated in an artificial diet was observed in the case of *Tribolium castaneum*. Various parameters of the wheat var. and β -sitosterol dosages in an artificial diet were compared. By this an attempt is made to correlate the resistance offered by four wheat var. to the amount of β -sitosterol present in them. AS

43

Matthews (WA). **An investigation of the non-solvent-extractable residues of [¹⁴C] chlorpyrifos-methyl in stored wheat.** *Pesticide Science* 31(2); 1991; 141-149

The residues of [¹⁴C]chlorpyrifos-methyl remaining in wheat after solvent extraction accounted for 28% of the applied dose after an extended period of storage. A bioassay of these residues was carried out using *Tribolium castaneum* and a significant reduction in the numbers of adults reaching maturity was observed. Attempts to release the non-solvent-extractable residues using an enzymic digestion procedure were unsuccessful, as were several of the chemical solubilisation procedures investigated. A water/methanol extraction system was successful in releasing up to 86% of the radioactivity leaving 10% still non-extractable. Analysis of this solubilised residue revealed that

59% was present as the pyridinol metabolite of chlorpyrifos-methyl and 26% was a polar material composed of two main components. Bioassay tests of these metabolites revealed that the reduction in the number of insects reaching maturity could be associated with the pyridinol metabolite. AS

44

Tiwari (SC), Rao (AS) and Dwivedi (BK). **Effect of storage period and interspecific competition among *Sitophilus oryzae* L., *Rhizopertha dominica* Fab. and *Tribolium castaneum* Herbst. on their build-up and the resultant loss to 6 varieties of wheat.** *Indian Journal of Entomology* 51(4); 1989; 411-415

Biostatistical assessment of influence of *S. oryzae*, *R. dominica* and *T. castaneum* and interspecific combinations of all 3 insects on the high yielding var. of wheat has been assessed, in the present investigation. One of the significant aspects of the present study was positive correlation of all 3 insects separately and grown together on all the tested var. of the wheat with infection period. Max. loss 48.37% - 48.96% was recorded by *S. oryzae* and *R. dominica* in K.W., H.D. 1553 and S. 277 var. of wheat. Min. loss 3.78% was recorded by *T. castaneum* in H.D. 1553. Max. loss 58.27% was recorded by interspecific combination of 3 insects. Shekhar and R.R. 21 were most suitable to all insects species individually or grown together. AS

Wheat flour

45

Sam Kuhl. **Milling hard amber durum wheat for semolina vs. milling hard wheat for flour.** *Indian Miller* 21(3); 1990; 25-29

A comparison is made in quality and milling differences between hard Amber Durum for semolina and hard wheat for bread flour cultivated in the USA. Physical and chemical data are tabulated for Durum, hard red spring and hard red winter wheats. The cleaning process, tempering and the milling for semolina and bread flour and the equipment suitable are briefly indicated. SRA

MILLETS

Corn

46

Mbofung (CMF) and Ndjouenkeu (R). **Influence of milling method and peanut extract on *in vitro***

iron availability from maize and sorghum flour gruels. *Journal of Food Science* 55(6); 1990; 1657-1659, 1675

The total, soluble and ionizable (available) iron as well as the phytate and neutral detergent fiber content of the maize and sorghum flour gruels varied with type of flour and also the amount of peanut extract used in the preparation. The ionizability of iron decreased with increase in phytate and neutral detergent fiber. Iron in the gruels from flours milled by the traditional method was more available than that in other gruels. BV

Corn starch

47

Dail (RV) and Steffe (JF). **Rheological characterization of crosslinked waxy maize starch solutions under low acid aseptic processing conditions using tube viscometry techniques.** *Journal of Food Science* 55(6); 1990; 1660-1665

Pearl millet

48

Chandna (M) and Matte (NK). **Characterization of pearl millet protein fractions.** *Phytochemistry* 29(11); 1990; 3395-3399

Analysis of pearl millet lines of diverse origin did not show any variation in the pattern of seed protein extracts on SDS-polyacrylamide gels. The only disulphide bonded polypeptides were of M_r 47-45,000 which on reduction yielded polypeptides of M_r 26-25,000. This represented the only constituent of pearl millet prolamin also. Prolamins and glutelins were the co-dominating solubility fractions and constituted ca 75% of the total protein fractions. Lysine and tryptophan were highest in the albumins and lowest in the globulin fraction. The major share of these amino acids in the grain protein was due to prolamins and glutelins. Gel electrophoresis of seed protein extracts of five wild species showed that *Pennisetum violaceum* was closely related to *Pennisetum americanum*, and thus may be the probable ancestor of present day pearl millet. AS

Popcorn

49

Singh (RP), Sehgal (KL) and Bakhshi (AK). **Screening for popping quality in popcorn.** *Journal of Food Science and Technology (India)* 28(5); 1991; 319-320

One hundred and nine half-sib families in quadruplicate were tested for popping quality to test the efficacy of using 'Popping value' instead of popping index. The popping value denoted only 15 families to be statistically at par with the best as compared to 21, 40 and 84 with respect to popping index, popped volume, and popping resp. Those 15 families were also best as regards the other characters studied. The popping value is having a very high phenotypic and genotypic correlation with the popping index and a highly significant correlation with the popping and popped volume. Popping value is recommended for use in the screening of popcorn var. as it selects min. allround best entries and possess a high degree of correlation with the established characters and direct commercial implication. AS

Sorghum

50

Singh (YP), Srivastava (AS) and Singh (SV). **Residues of phosphamidon, endosulfan and monocrotophos in/on sorghum grains.** *Indian Journal of Entomology* 50(1); 1988; 17-23

The residues of phosphamidon, endosulfan and monocrotophos were determined in/on sorghum grains, when the crop was treated with respective insecticides. Two subsequent sprays of phosphamidon (0.300 kg a. i./ha) deposited 2.68 p.p.m. toxicant in/on sorghum grains which degraded below the tolerance limit of 0.5 p.p.m. within 11 days and reached below detectable level in 20 days. The half life of phosphamidon on sorghum grains was found to be 13.87 days. The initial deposit after two spray of endosulfan (0.500 kg a. i./ha) was 3.14 p.p.m. in/on sorghum grains which decreased to 1.17 p.p.m. in 5 days and was below the tolerance limit of 2 p.p.m. It reached below detectable level in 20 days and its half life was 11.95 days. The deposit of 3.67 p.p.m. was found after two sprays of monocrotophos (0.300 kg a. i./ha), which reached below tolerance limit of 0.2 p.p.m. in 17.2 days and totally in about 20 days. The half life of monocrotophos was calculated to be 14.19 days on sorghum grains. AS

51

Mundiware (SK), Patel (JD), Men (UB) and Kandalkar (HG). **Efficacy of synthetic pyrethroids against sorghum pests.** *Indian Journal of Entomology* 51(2); 1989; 172-176

The efficacy of four pyrethroids viz., decamethrin (0.0025% and 0.005%), fenvalerate (0.01%), cypermethrin (0.01% and 0.02%) and permethrin BPM and ICI (both 0.01%) alongwith endosulfan (0.05%) and untreated control were evaluated

against sorghum pests at Punjabrao Krishi Vidyapeeth, Akola during kharif, 1981. The results indicated that fenvalerate (0.01% decamethrin (0.005% and 0.00025%) and permethrin ICI (0.1%), were effective against stem borer, decamethrin (0.005% and 0.0025%), fenvalerate (0.01%) and endosulfan (0.005%) controlled aphids effectively, endosulfan (0.05%), fenvalerate (0.01%) and decamethrin (0.005% and 0.025%) were best against mites, whereas decamethrin (0.005% and 0.0025%), fenvalerate (0.01%) and permethrin ICI (0.01%) controlled midge fly very effectively. In general insecticides viz. fenvalerate (0.01%) and decamethrin (0.005% and 0.0025%) were found quite effective against all the above sorghum pests. AS

PULSES

52

Shivanna (BD), Ramakrishna (M) and Ramadoss (CS). **Purification and properties of the anionic form of α -galactosidase from germinating guar (*Cyamopsis tetragonolobus*).** *Plant Science* 72(2): 1990; 173-180

Three forms of α -galactosidase occur in germinating guar representing 100% of the activity present. They are α -galactosidase-A (anionic, 28%), α -galactosidase-C₁ (cationic, 12%) and α -galactosidase-C₂ (cationic, 60%). The second major form of α -galactosidase (the anionic form) from germinating guar has been purified to near homogeneity. It has a mol. wt. of 97,000 and consists of 2 identical subunits each of M_r 42,000. The physico-chemical, kinetic and immunological properties of this enzyme were studied in comparison with the major cationic α -galactosidase present in germinating guar. The molecular size of α -galactosidase-A was only half of α -galactosidase-C₂ as judged by gel filtration studies. Both forms were found to be glycoproteins, but their carbohydrate content and composition were quite different. The analysis of amino acid comp. showed a striking dissimilarity with respect to glutamic acid, methionine, histidine and arginine content. There were distinct differences in their kinetic properties as well. The polyclonal antibody raised against α -galactosidase-C₂ did not show any cross reactivity with α -galactosidase-A showing that the two forms are immunologically distinct. AS

53

Dias (CAR) and Yadav (TD). **Ovipositional preference of pulse beetles to four legume seeds.** *Indian Journal of Entomology* 50(4): 1988; 480-487

Ovipositional preference of *Callosobruchus maculatus* Fab., *C. chinensis* (Linn.) and *C. analls* Fab. was tested, involving five different colours of chickpea and pigeonpea. Dark brown colour of pigeonpea was preferred. Among the cowpea, green gram, pigeonpea and chickpea, cowpea was preferred most by all species of pulse beetles. The preference tests were conducted in nine sets. Plastic tray (35 x 47 x 7.5 cm) was adjudged most appropriate to exhibit oviposition in horizontal movement. In case of flight test, a polythene chamber (30 x 30 x 30 cm) was found suitable. Chickpea was preferred by *C. chinensis*. The pods of cowpea, green gram and pigeonpea were oviposited by all the three species. Chickpea pods did not allow oviposition of any species. The results of oviposition preference have been discussed in the light of field infestation and subsequent losses. AS

54

Srivastava (KM) and Pant (JC). **Growth and developmental response of *Callosobruchus chinensis* (Linn) to different pulses.** *Indian Journal of Entomology* 51(2): 1989; 196-199

C. chinensis (L) is highly selective for their host. Developmental period varies in different pulses according to their selective nature. Variability in food (different pulses) does not have any significant impact on sex ratio. Lentil, green gram, red gram, Bengal gram and cowpea are preferred food and pea, Khesari are the less preferred, where as *Bhut*, soybean are still unsuitable for the beetles while black gram and French bean are not suitable food for *C. chinensis* (L.) at all. AS

Cowpeas

55

Bakr (AA) and Gawish (RA). **Nutritional evaluation and cooking quality of dry cowpea (*Vigna sinensis* L.) grown under various agricultural conditions. 1. Effect of soaking and cooking on the chemical composition and nutritional quality of cooked seeds.** *Journal of Food Science and Technology (India)* 28(5): 1991; 312-316

Foliar application with gibberellic acid (GA₃) and white wash, especially under saline conditions, improved the nutritive value of raw cowpea seeds by increasing total protein, soluble carbohydrate, total free amino acids and *In vitro* protein digestibility as well as reducing antinutritional factors i.e. trypsin inhibitor activity, phytic acid and tannins. Cooking in water containing sodium chloride (2%) after soaking in hot water for 12 h showed the lowest content of protein, carbohydrate and antinutritional factors and the highest content of fibre, ash and

digested protein. Crude fat remained unaltered. Highest loss in total free amino acids was observed for the unsoaked and cooked seeds. AS

56

Don-Pedro (KN). **Insecticidal activity of fatty acid constituents of fixed vegetable oils against *Callosobruchus maculatus* (F.) on cowpea.** *Pesticide Science* 30(3): 1990; 295-302

The insecticidal activity of lauric, oleic and linoleic acids against *Callosobruchus maculatus* on cowpea was investigated in lab. bioassays. In pre-oviposition grain treatments, it was found that, at dosages between 1.96 and 11.5 g kg⁻¹ lauric acid had no effect on progeny development, while the oily oleic and linoleic acids were active in reducing progeny development. The active fatty acids had no effect on oviposition (in no-choice experiments) or on mortality of adults or larvae that successfully penetrated treated cowpea seeds, and their insecticidal activity, like that of fixed vegetable oils, depended mainly on ovicidal action. When applied to cowpeas in a pure state, oleic acid had an LC₅₀ value of 1.64 ml kg⁻¹, which made it approx. 3 and 8 times more toxic against eggs of *C. maculatus* than groundnut oil and linoleic acid resp. When the ovicidal activities of the 3 fatty acids were tested by dipping egg-infested seeds in acetone-based solutions, they were all found to be similarly toxic, lauric, oleic and linoleic acids having LC₅₀ values of 40, 38 and 26 ml l⁻¹ resp. (with overlapping 95% C.L.). These values made them 2-4 times more toxic than acetone-based solutions of groundnut and traditional coconut oils. The possibility of employing fatty acids in large-scale and traditional small-scale food storage systems is discussed. AS

Faba beans

57

Ismond (MAH), Georgiou (C), Arntfield (SD) and Murray (ED). **Role of noncovalent forces in micellization using legumin from *Vicia faba* as a study system.** *Journal of Food Science* 55(6): 1990; 1638-1642

OILSEEDS AND NUTS

58

NPC Centre for Agricultural Productivity. **Production and availability of oilseeds and oils in India.** *Productivity* 31(2): 1990; 312

Cashew nuts

59

Anon. **Nutritive value of cashew nuts.** *Indian Cashew Journal* 19(3): 1989; 9-14

Coconuts

60

Nanda Kumar (TB). **Tender coconut water: Nature's finest drink.** *Indian Coconut Journal* 21(4): 1990; 14-18

The properties, therapeutic value and other uses of tender coconut water are described briefly in this article. BV

Rapeseeds

61

Dietz (HM), King (RD) and Harris (RV). **The aqueous extraction of glucosinolates from rapeseed.** *International Journal of Food Science and Technology* 26(1): 1991; 53-63

The effectiveness of the Overseas Development Natural Resources Institute process in its application to the aqueous leaching of the South Asian rapeseed var. Toria. Soaking of seeds in boiling water for 5 min at a seed/water ratio of 1:3 ensured the inactivation of myrosinase; water absorption and swelling of the seeds improved dehulling and the heat treatment reduced the protein solubility. Three stage cross-current leaching at a seed/water ratio of 1:10 reduced the glucosinolate content by 98% while crude protein loss was about 8.6%. Adjusting pH of the extraction water or increasing the water temp. (40, 50 and 80 C) did not lead to an increased leaching efficiency. Seed/water ratio was found to be the most important factor during leaching. BV

Safflower

Safflower proteins

62

Ordorica-Falomir (C) and Paredes-Lopez (O). **Effect of safflower protein isolates on cookie characteristics.** *International Journal of Food Science and Technology* 26(1): 1991; 39-43

The effects of adding safflower protein isolates (SPI) to wheat flour based sugar cookies was investigated. SPI obtained by the two different procedures (micellization (MP) and isoelectric precipitation (IP)) using two different safflower meals. The amount of SPI added was that needed to increase the protein content of wheat flour by 20, 40 and 60%. Physical and sensory properties of products were not

significantly ($P < 0.05$) affected by fortification with safflower protein prepared by MP. Some deterioration of these properties was observed when IP and soybean isolates were used. BV

Sesame

63

Choudhary (R), Singh (KM) and Singh (RN). **Dissipation of carbaryl residues in *Sesamum indicum* Linn.** *Indian Journal of Entomology* 50(1); 1988; 1-4

Sesame plants were treated with 0.2% of carbaryl during *Kharif* 1983 and 1984. This resulted in residue of 15.07 p.p.m. on sesame plants immediately after spray and thereafter 1st, 3rd, 5th, and 10th days were 11.00, 4.95, 2.42 and 0.33 p.p.m., resp. during *Kharif* 1983. Similarly, it was 15.18 p.p.m. as initial deposit in *Kharif* 1984 and same, after 1st, 3rd, 5th and 10th days of spraying were 11.00, 5.06, 2.53 and 0.44 p.p.m., resp. The RL_{50} values and T_{tol} values were 1.80 days and 7.18 days, resp. during *Kharif* 1983. While during *Kharif* 1984 the values were 1.94 days and 11.84 days, resp. No residue of carbaryl was detected in oil or cake after 25 days of spraying. AS

Soybeans

64

Gandhi (AP) and Bourne (MC). **Effect of pre-soaking on the rate of thermal softening of soybeans.** *International Journal of Food Science and Technology* 26(1); 1991; 117-121

Whole soybeans and dehulled soybean cotyledons were soaked in water at ambient temp. for 0, 8 and 12 h then cooked in boiling water at atm. pressure for up to 6 h. In every case there was an initial rapid rate of softening followed by progressively slower softening until, after about 3 h, there was little change in firmness. The kinetics of softening of every sample was consistent with the two substrate theory of thermal softening. The firmness ranking in descending order after 15 min cooking was no soak, whole beans > 12 h, soak cotyledons > no soak, cotyledons > 8 h soak, whole beans > 12 h soak, whole beans. This ranking was maintained for the entire cooking period. For whole beans the soaked samples were less firm than the unsoaked samples while for the cotyledons the soaked samples were more firm than the unsoaked. This reversal in behaviour may be caused by the seed coat (skin) retarding the imbibition of water in the whole beans thus delaying the onset of enzyme activity in the bean tissue. AS

Soy products

Soy milk

65

Chang (C-Y) and Stone (MB). **Effect of total soy milk solids on acid production by selected *Lactobacilli*.** *Journal of Food Science* 55(6); 1990; 1643-1646, 1678

Soy milk was fermented by *Lactobacillus fermentum* NRRL B-585 or *L. acidophilus* NRRL B-1910 or B-2092 and evaluated as a substrate for lactic acid production. Mean values of acid production were: NRRL B-585 7.00 to 16.15, B-1910 32.30 to 39.10, and B-2092 27.20 to 34.85 (μ mole lactic acid/g soy milk). B-1910 and B-2092 grew better than B-585, in soy milk without fortification. Effects of protein and carbohydrate contents of soy milk on acid production were different among strains of lactobacilli. To make acceptable fermented soy milk, the consistency and acid development of the final product are important. BV

Soy proteins

66

Fujio (Y), Hayashi (N) and Hayakawa (I). **Effect of moisture content on flow behaviour of molten soy-protein isolate under an elevated temperature.** *International Journal of Food Science and Technology* 26(1); 1991; 45-51

The flow behaviour of molten soy-protein isolate (SPI) with moisture content ranging from 17 to 41% was measured with a capillary rheometer under an elevated temp. of 140 C. The flow-starting temp. of SPI under 90 MPa pressure was inversely proportional to the moisture content. The relationship between flow rate and pressure drop for a molten SPI with 17-35% moisture was non-linear on a log-log scale, while it was linear for molten SPI with 41% moisture. Based on these results, the shear characteristic of a molten SPI with 41% moisture can be classified as a power-law fluid with a flow behaviour index of 0.3. However, a molten SPI with 17-35% moisture may be classified as an unknown type of non-Bingham plastic. AS

TUBERS AND VEGETABLES

67

Noble (A), Walsh (JJ) and Outhwaite (RJ). **A field unit for determining dimethoate in fruit and vegetable dips.** *Pesticide Science* 29(4); 1990; 387-395

The concn. of dimethoate in post-harvest dips needs to be maintained at 400 or 500 mg l⁻¹ to ensure that fruit fly are killed and also to keep residue levels below the MRL. A field unit which contains a colorimeter, a heating block and cooling positions has been evaluated. The diluted dip sample produces a colour with 4-(p-nitrobenzyl)pyridine after heating and the addition of tetraethylenepentamine. Precision of the unit was acceptable for a field test (repeatability of plus or minus 10.1%) and there was reasonable agreement between detn. made on the unit and by an HPLC method for a range of dimethoate concn. from 300 to 700 mg l⁻¹. The unit can be used at the dip site and the analysis is completed in 30 min. AS

Cassava

68

Okafor (N) and Ejiofor (AO). **Rapid detoxification of cassava mash fermenting for garri production following inoculation with a yeast simultaneously producing linamarase and amylase.** *Process Biochemistry* 25(3); 1990; 82-86

Eight yeast and one bacterium capable of simultaneously producing linamarase and amylase were isolated from cassava fermentation environments in Awka, Nigeria. The yeast *Schwanniomyces alluvius* (isolated from potato starch) was the highest producer of these enzymes followed by *Saccharomyces* sp. and a *Leuconostoc* sp. Most linamarin breakdown in uninoculated cassava mash occurred in the first 48 h and was faster when fluid was not squeezed out from the mash. Breakdown was even more rapid when a linamarase/amylase producing *Saccharomyces* was inoculated into mash, 24 h fermentation being adequate with such inoculation. However yeast inoculation into mash did not lead to an increase in the protein content of garri produced from it. AS

Tubers

69

Santha (N), Sudha (KG), Vijayakumari (KP), Nayar (VU) and Moorthy (SN). **Raman and infrared spectra of starch samples of sweet potato and cassava.** *Proceedings of the Indian Academy of Science, Section A* 102(5); 1990; 705-712

Raman and infrared spectra of starch samples from sweet potato and different var. of cassava (tapioca) are reported. Three regions of the spectra, the OH stretching region (3560 - 3000 cm⁻¹), the CH stretching region (3000 - 2800 cm⁻¹) and the finger print region (1600 - 200 cm⁻¹), have been studied. The results are discussed in relation to the hydrogen bonding and the properties of starch samples. AS

Potatoes

70

Mondy (NI) and Seetharaman (K). **Effect of irradiation on total glycoalkaloids in Kennebec and Russet Burbank potatoes.** *Journal of Food Science* 55(6); 1990; 1740-1742

Total glycoalkaloids (TGA) of Kennebec and Russet Burbank potatoes increased significantly ($P < 0.005$) immediately following irradiation (10 krds), but decreased upon storage. TGA levels of Kennebec tubers were close to those considered unsafe for human consumption. At 5 C TGA was higher in tubers stored in paper as compared to polyethylene, while at 20 C this was reversed. BV

Sweet potatoes

71

Diamante (LM) and Munro (PA). **Mathematical modelling of hot air drying of sweet potato slices.** *International Journal of Food Science and Technology* 26(1); 1991; 99-109

The effect of air dry bulb temp., air relative humidity, air velocity and sample thickness on the thin-layer air drying of sweet potato slices was investigated. The drying rate curves consisted of two approx. linear falling rate periods and contained no constant rate period. Several mathematical models were fitted to the drying rates of sweet potato slices under a range of drying conditions. It was found that the modified Page equation best described the thin-layer air drying of sweet potato slices down to a moisture content of 10% dry basis. Correlations were also determined for the slope and intercept of the modified Page equation in terms of the experimental variables. AS

Vegetables

Brinjal

72

Singh (SV) and Kavadia (VS). **Determination of endosulfan and carbaryl residues in/on brinjal fruits.** *Indian Journal of Entomology* 50(4); 1988; 437-440

The residues of endosulfan and carbaryl were determined, in the brinjal fruits obtained from the crop treated with them at the rate of 0.07% and 0.1% spray solution, resp. The deposits of 5.47 to 5.66 p.p.m. endosulfan lost to about 50% in 3 days and completely in 21 days and reached below tolerance

limit of 2 p.p.m. in 7 days. The carbaryl deposits of 6.45 to 6.622 p.p.m. degraded by 50% in about 5 days and completely in 15 days. Its residues, however, were within tolerance limit in 3 days. Dissipation of both endosulfan and carbaryl was faster at higher temp. Waiting period of 7 and 3 days for endosulfan and carbaryl were required, resp. before the fruits were safe for consumption. AS

Cabbages

73

Nath (G) and Srivastava (MK). **Effect of processing on the removal of malathion from treated cabbages (*Brassica oleracea* L. var. capitata).** *Indian Journal of Entomology* 52(2); 1990; 300-309

Removal of malathion deposits and residues by various processings viz. washing, open and steam cooking and dehydration from heads and leaves of cabbages treated with 0.05% and 0.1% malathion sprays have been estimated by colorimetric and enzyme inhibition methods. Except for open cooking, the initial deposits on heads treated with 0.05% malathion sprays reduce below the tolerance limit by various processings. However, in cabbage heads treated with 0.1% malathion sprays and in leaves treated with either of the two dosages, the processings do not bring down the initial deposits below the tolerance level. When cabbage heads containing one day old residues are either cooked open or steam cooked after washing, the residues fall below the tolerance level even in higher dosage application. The initial deposits as well as the residues in leaves are generally very high and are not removed by washing even on the third day. From the available residue data in India and the present findings it may be concluded that a waiting period of atleast 7 days be observed if the leaves are also to be consumed. Use of malathion on cabbage is, otherwise safe with a waiting period only of one day if it is consumed after processing. AS

Cucumbers

74

Naewbanij (JO), Stone (MB) and Chambers (EIV). ***Lactobacillus plantarum* and *Enterobacter cloacae* growth in cucumber extracts containing various salts.** *Journal of Food Science* 55(6); 1990; 1634-1637

Substitution of KCl for NaCl at 50% resulted in more selective growth of *Lactobacillus plantarum* than in those with either KCl or NaCl alone. KCl was the only chloride substitute allowing growth of *Enterobacter cloacae*. Substitution of phosphates for NaCl at 50% enabled slow growth of *L. plantarum*. BV

Leafy vegetables

75

Saraswathi (K), Dasaratha Ramaiah (M) and Ramana (VV). **Extractive spectrophotometric method for the determination of iron (III) in green leafy vegetables using sodium pentamethylene dithiocarbamate.** *Journal of the Indian Chemical Society* 63(2); 1991; 116-117

A simple and sensitive spectrophotometry based on sodium pentamethylene dithiocarbamate procedure for Fe^{III} detn. in green leafy vegetables has been described. Results indicated that the metal chelate showed max. absorbance in the pH range 3-6 in sodium acetate and acetic acid buffer. Quantitative detn. of Fe was possible in the range 1-15 p.p.m. of Fe^{III} per 10 ml of the organic layer. The molar absorptivity of the complex and sensitivity are found to be $1.96 \times 10^{-3} \text{ dm}^3 \text{ mol}^{-1} \text{ cm}^{-1}$ and $0.02 \mu\text{g cm}^{-2}$ resp. The composition of the complex and the ratio of metal-to-ligand was found to be 1:3. The instability constant was 2.0×10^{-9} . The procedure is for the detn. of Fe^{III} in the leaves of *Amaranthus viridis* and *A. gangeticus*. SRA

Okra

76

Yadav (SS) and Yadav (PR). **Degradation of endosulfan in and on unprocessed and processed okra fruits.** *Indian Journal of Entomology* 51(3); 1989; 315-321

Okra (*Abelmoschus esculentus* Moench.) was raised during summers of 1980 at farmer's field near Hissar to see degradation behaviour of endosulfan in/on marketable fruits and to observe the effect of washing and boiling/cooking on its persistence. The toxicant was applied thrice at the rate of 1.61 Thiodan 35 EC/ha each time at 15 days interval. For analysis, samples were collected at 0, 1, 3, 6, 10 and 15 days after the first and third sprayings. Microquantities of insecticide were determined by spectrophotometric method. Recovery of endosulfan was 93.20%. In unprocessed fruits, the initial deposits were 4.43 to 4.89 p.p.m. and at the time of final sampling, the insecticide persisted to the tune of 0.14 to 0.25 p.p.m. resulting in 94.89 to 96.84% dissipation. Insecticide degraded faster in the beginning which decreased as the time elapsed. The half life values were 3.54 to 4.12 days in both the sprayings. The loss of endosulfan from okra fruits due to washing and boiling/cooking at different sampling intervals varied from 42.85 to 59.19 and 61.32 to 74.49%, resp. The residue reached below prescribed tolerance level of 2 p.p.m. within three and one days of spraying in

unprocessed and washed fruits while in boiled/cooked fruits, even the initial deposits were below the prescribed tolerance level. It can be concluded that boiled/cooked fruits can be consumed even just after treatment without any danger to the health of the consumers. However, just to be on safer side, one day time interval between the spraying and consumption of such treated fruits after boiling/cooking is desirable. AS

Tomatoes

77

Stoforos (NG) and Reid (DS). **A test for evaluation of the serum separation potential of tomato ketchup.** *Journal of Food Science* 55(6); 1990; 1626-1629

The tendency of tomato ketchup to separate into a structural solids phase and a serum phase was measured by placing a small amount of ketchup on a wire screen mounted at the bottom of a plexiglass tube. The screen retained structural solids along with "bound" serum while "unbound" serum drained through and collected in a holder tube below the screen. Rate and degree of separation were particularly applicable to study separation potential of single serving ketchup pouches. Although reducing storage temp. decreased initial rate of serum separation, final amount of serum loss was independent of temp. AS

78

Sarode (SV) and Adsule (PG). **Effect of different process on fenitrothion residues in tomato.** *Indian Journal of Entomology* 51(4); 1989; 475-477

FRUITS

79

Shah (GH) and Bains (GS). **Flow behaviour of peach and apricot pulps and concentrates of some Indian varieties.** *Journal of Food Science and Technology (India)* 28(5); 1991; 308-311

A coaxial cylinder viscometer (Rheotest 2) was used to determine the flow behaviour of pulps and conc. of peach and apricot cvs. Power law values for the flow behaviour index 'n' of pulps and conc. were in the range of 0.20 to 0.39 indicating the pseudoplastic nature of the products. Apparent viscosity 'napp' and consistency coeff. 'k' values were dependent on shear rate and temp. Magnitude of yield stress obtained by extrapolating the shear rate-shear stress data according to Casson, depended on temp., being higher at lower temp. Bolger model parameters indicated that the shear

resistance of the network type structure was responsible for the higher plasticity of conc. than those of pulps. Consistency index K_1 values determined by Herschel - Bulkley model decreased with increase in temp. AS

80

Ayranci (E), Ayranci (G) and Dogantan (Z). **Moisture sorption isotherms of dried apricot, fig and raisin at 20 C and 36 C.** *Journal of Food Science* 55(6); 1990; 1591-1593, 1625

Isotherms were found to be of type I, typical of high sugar foods. Study on temp. dependence of isotherms showed that above water activities of 0.6, moisture content was higher at higher temp. This was explained by endothermic dissolution of sugar at high water activities. Iglesias and Chirife, Halsey, BET and GAB equations were tested to fit the data. Monolayer moisture contents for the three foods were determined from BET and GAB equations. In both models monolayer moisture was found to decrease with increasing temp. Isosteric heat sorption data from the isotherms at two temp., revealed that strength of interactions between water vapour and adsorbent increased with moisture content. AS

81

Tsami (E), Marinos-Kouris (D) and Maroulis (ZB). **Water sorption isotherms of raisins, currants, figs, prunes and apricots.** *Journal of Food Science* 55(6); 1990; 1594-1597, 1625

Moisture sorption of dried fruits [Sultana raisins, Corihthian (black) currants, figs, prunes and apricots] were determined at 15, 30, 45 and 60 C, using the standard static gravimetric method developed by the European Cooperation Project COST 90. Experimental curves showed an inverse effect of temp. at high moisture content due to high sugar content of dried fruits. The hysteresis between adsorption and desorption was verified experimentally. The GAB equation was used to predict experimental data for water activity range 0 - 0.95. AS

82

Kaletunc (G), Nussinovitch (A) and Peleg (M). **Alginate texturization of highly acid fruit pulps and juices.** *Journal of Food Science* 55(6); 1990; 1759-1761

83

Saxena (RC), Srivastava (RP), Rameshwar Singh and Srivastava (AK). **Studies on residues of**

insecticides in/on locally marketed fruits and vegetables. *Indian Journal of Entomology* 52(2): 1990; 258-264

To determine extent of insecticide residues 8 vegetables (lady's finger, brinjal, chillies, tomato, cauliflower, bean, pea and cabbage) were brought from the market of Udaipur city from August, 1981 to Feb., '82. All the 8 vegetables were found contaminated with insecticide residues. The residue of malathion was found more than the permissible limits in tomato, lady's finger, cauliflower, brinjal and beans. Out of 40 samples of different vegetables found contaminated with organophosphate insecticides, 34 were having more residues than the permissible limits. The use of BHC on cauliflower has not been recommended even though the residue of BHC was found on this vegetable. The carbaryl was detected in lady's finger, chillies and brinjal but residues were below prescribed limits. AS

Apples

84

Sell (CR) and Moffitt (HR). **Non-destructive method for estimating methyl bromide residues in apples during aeration following fumigation.** *Pesticide Science* 29(1): 1990; 19-27

The results show that the concn. of methyl bromide (MB) residues in apples can be estimated from the rate of decline of MB in the exhaust air stream during aeration. The persistence and concn. of MB residue in apples depend on parameters of fumigation that can be manipulated to hasten removal of the residue. BV

Bananas

85

Hamza-Chaffai (A). **Effect of manufacturing conditions on rheology of banana gelified milk: Optimization of the technology.** *Journal of Food Science* 55(6): 1990; 1630-1633

The effect of cooking time (15-85 min), cooking temp. (65-95 °C), starch concn. (7-11 g.L⁻¹) and carrageenan concn. (2-6 g.L⁻¹) on banana gelified milk showed cooking temp. had significant effect on yield stress. An optimized product was prepared reducing cooking time and temp. Carrageenan product was prepared reducing cooking time and temp. Carrageenan was optimized to 3.5 g.L⁻¹. This provided a product with good texture and acceptable taste. This system has some economic advantages: (1)reduction of cooking time from 60 min to 45 min

leads to better productivity; (2)reduction in energy consumption and (3)the lessening of carrageenan use allows lower cost. BV

Grapes

86

Querol (A), Jimenez (M) and Huerta (T). **Microbiological and enological parameters during fermentation of musts from poor and normal grape-harvests in the region of Alicante (Spain).** *Journal of Food Science* 55(6): 1990; 1603-1606

Must and wine from grapes harvested in two vintages (1986 and 1987) were analyzed during vinification for physicochemical and microbiological characteristics. The 1986 vintage would be considered abnormal or poor vintage because of higher rainfall at harvest, and the 1987 one a normal vintage. Low reducing sugars and high volatile acidity at the beginning of the poor fermentation was observed as compared to normal vinification. The yeast population showed a typical evolution through the process since oxidative yeasts were isolated in the first stages of the poor vinification. AS

87

Scrano (L), Faretra (F), Cariddi (C), Antonacci (E) and Bufo (SA). **Evaluation of dicarboximide residues in cold-stored grapes exported to field and post-harvest treatments.** *Pesticide Science* 31(1): 1991; 37-44

Dicarboximide fungicides (dichlozolate, iprodione, procymidone or vinclozolin) residues were determined through GC analysis on grapes exposed to post-harvest treatments. Post-harvest fumigation caused only a slight increase of residue levels as compared to field applications. BV

Lychee

88

Huang (S), Hart (H), Lee (H) and Wicker (L). **Enzymatic and colour changes during post-harvest storage of lychee fruit.** *Journal of Food Science* 55(6): 1990; 1762-1763

Mangoes

89

Gholap (AS), Bandyopadhyay (C) and Nair (PM). **Lipid composition and flavour changes in irradiated mango (var. Alphonso).** *Journal of Food Science* 55(6): 1990; 1579-1580, 1584

Ripening (at 25-30 C) of γ -irradiated (0.25 kGy) and control mature green Alphonso mangoes showed changes in glycerides as well as fatty acids. Oleic acid of pulp oil of irradiated mangoes decreased appreciably during ripening as compared to controls. Linoleic acid of pulp oil of unirradiated fruits decreased markedly on the 6th day of storage. With irradiated fruits linolenic remained unaffected upto the 12th day of storage. Linolenic acid content of pulp oil of irradiated fruit increased much more than that of unirradiated fruit during ripening. GC profiles of volatiles of control and irradiated mangoes showed no difference. BV

Peaches

90

Forbus (WRJr) and Dull (GG). **Delayed light emission as an indicator of peach maturity.** *Journal of Food Science* 55(6); 1990; 1581-1584

Results showed that delayed light emission (DLE) was highly correlated with av. maturity rank ($r = 0.96$) for all three peach cvs (Keystone, Loring and Nectar). DLE can be used as an effective, nondestructive technique for measuring peach maturity. BV

91

Senter (SD) and Callahan (A). **Variability in the quantities of condensed tannins and other major phenols in peach fruit during maturation.** *Journal of Food Science* 55(6); 1990; 1585-1587, 1602

Quantities of condensed tannins and the major monomeric phenols were max. between the first and second swell of fruit growth in six melting flesh peach cv. Quantities of tannins were higher and vanillin-proanthocyanidin ratios were lower in low quality, astringent fruit than in white or yellow flesh, commercial quality fruit. Major monomeric phenols in all cvs were chlorogenic acid, neochlorogenic acid, isochlorogenic acid, catechin and epicatechin. Quantities of these compounds varied by cv and also were greater in the low quality, astringent fruit between the first and second swell of growth. AS

Raisins

92

Akrida-Demertzi (K), Drainas (C) and Koutinas (AA). **Significance of copper in alcohol production with fermentation of raisin extracts by the cell recycle process.** *Journal of Food Science* 55(6); 1990; 1588-1590, 1616

CONFECTIONERY, STARCH AND SUGAR

93

Irwin (WE). **Reduced calories bulk ingredients: Isomalt.** *Manufacturing Confectioner* 70(11); 1990; 55-60

Briefly covers history of isomalt manufacture, properties, applications (pan coated, chocolate, chewing gum) availability and current regulatory status. BV

94

Kopchik (FM). **Reduced calorie bulk ingredients: Polydextrose and polydextrose II.** *Manufacturing Confectioner* 70(11); 1990; 61-63

Confectionery

95

Ross (RE). **Bulk ingredients: Sugar alcohols and alternative sweeteners in confections.** *Manufacturing Confectioner* 70(11); 1990; 49-54

Covers sugar alcohols, sorbitol, mannitol, xylitol, hydrogenated starch hydrolysates, maltitol and lactitol. BV

96

Klacik (K). **Applications in confectionery: Sugarless hard candy technology review.** *Manufacturing Confectioner* 70(11); 1990; 69-76

Covers manufacturing processes (depositing process) and functional ingredients (xylitol, improved polydextrose, mannitol, intense sweeteners, stability of sugarless base ingredients). BV

97

Minson (E). **Applications in confectionery: Sucrose-free confectionery coatings.** *Manufacturing Confectioner* 70(11); 1990; 81-84

Candy

98

Haluska (RJ). **Colour development in candy.** *Manufacturing Confectioner* 70(10); 1990; 65-69

Starches

99

Chinachoti (P) and Stengle (TR). **Water mobility in starch/sucrose systems: An oxygen-17 NMR study.** *Journal of Food Science* 55(6); 1990; 1732-1734

Sucrose/starch mixtures containing 0, 10 and 20% sucrose were equilibrated with water vapour enriched to 1% ^{17}O , at water activities (a_w) of 0.88, 0.93 and 0.97. In all samples, a significant quantity of water did not appear in the NMR spectrum, presumably because it was immobilized. The amount of water, which was somewhat mobile and appeared in the spectrum, increased with increasing a_w and sucrose content. The relaxation time of this NMR active water was strongly dependent on sucrose content, in a way that could not be explained by any simple model. Thus, the presence of sucrose has a profound effect on interaction of starch with water. AS

100

Dail (R) and Steffe (JF). **Dilatancy in starch solutions under low acid aseptic processing conditions.** *Journal of Food Science* 55(6); 1990; 1764-1765

BAKERY PRODUCTS

101

Leelavathi (K), Haridas Rao (P) and Shamanthaka Sastry (MC). **Studies on the utilization of sunflower kernels in bakery products.** *Journal of Food Science and Technology (India)* 28(5); 1991; 280-284

Studies on the incorporation of roasted sunflower grits showed that the overall quality of bread was not changed upto 10% level, while at the same level defatted sunflower flour significantly lowered the overall quality. Use of roasted grits improved the taste of biscuits and it could be used upto 20% level without affecting the overall quality. On the other hand, sunflower flour lowered the overall quality even at 10% level on incorporation. Incorporation of either defatted flour or roasted grits improved the taste of cakes while the overall quality improved with increase in the level of roasted grits even upto 30% level. Roasting decreased chlorogenic acid by 58% and available lysine by 22%. AS

102

Maya Prakash, Sarojani Dastur (K) and Suwendu Bhattacharya. **Studies on the storage characteristics of Khakra.** *Journal of Food Science and Technology (India)* 28(5); 1991; 285-287

khakra is a crisp wheat based flatbread, like chapathi, having low moisture content (4 - 6%). Storage characteristics of Khakra were investigated at normal (27 C/65% rh) and under accelerated (38 C/92% rh) conditions. The sorption studies of

Khakra, exposed to different rh (11 - 86%), have suggested that a moisture level of 7.8% corresponding to 44% rh is critical with respect to crispness. The product had a storage life of about 3 months under normal storage conditions, when packaged in polyethylene (65 - 70 micron) or polypropylene (32 micron) pouches. The moisture content of Khakra during storage could be expressed by quadratic regression equations. The sensory quality and instrumental texture of Khakra during storage were also determined. AS

Biscuits

103

Agrawal (SR). **Prospects for small scale biscuit industry in the nineties.** *Indian Food Industry* 9(3); 1990; 19-21, 23

This paper discusses the main problem of the small scale biscuit industry, consumption pattern of the biscuits, market share of the biscuits, latest trends and opportunities which will be available to the industry during the nineties. BV

Bread

104

Chowdhry (S). **Bread industry in India - looking ahead.** *Indian Food Industry* 9(3); 1990; 22-23

This article covers development of bakery industry and long term strategies for storage to cope with increased production. BV

105

Haridas Rao (P). **Recent developments in the use of shortenings and surfactants in breadmaking.** *Indian Food Industry* 9(3); 1990; 28-32

This article covers developments in shortenings (plastic shortening, fluid shortening, powdered shortening, effect of shortening on bread quality, interaction of wheat flour lipids and added shortening and the present trend) and developments in surfactants (chemistry, mechanism of surfactants in breadmaking, effect of surfactants on the dough and bread quality, surfactants as a replacement of natural lipids in bread and surfactants in high protein breads). 21 references. BV

106

Leiras (MC) and Iglesias (HA). **Water vapour sorption isotherms of two cake mixes and their components.** *International Journal of Food Science and Technology* 26(1); 1991; 91-97

The water vapour sorption isotherms of two cake mixes and of their ingredients were measured to test whether isotherms of mixes could be predicted from those of the ingredients with sufficient accuracy for practical use. Their comp., mainly wheat flour and sugar, accounts for BET type II behaviour up to a w of 0.75, and type III above. Prediction was very poor above 0.75 because of interactions between components, and possibly useful below 0.75, which is the region of greatest interest for defining packaging and storage conditions to maximize shelf-life of such products. AS

Pasta

107

Cole (ME), Johnson (DE), Cole (RW) and Stone (MB). **High temperature-short time pasta, processing: Effect of formulation on extrudate properties.** *Journal of Food Science* 55(6); 1990; 1651-1656

Effects of wheat type and functional ingredients on selected characteristics of pregelatinized pasta manufactured by high temp.-short time twin-screw extrusion were evaluated by physicochemical methods. Although wheat type exerted minor influence on max. force, total organic matter, and water absorption index, both durum and hard wheats were suitable as raw materials for production of pregelatinized pasta. Most differences in quality characteristics of pasta supplemented with additives were attributable to effects glyceryl monostearate. Neither disodium phosphate (1.0% nor wheat gluten 5.0%) substantially affected physicochemical properties related to textural quality. AS

MILK AND DAIRY PRODUCTS

108

Thompson (DK), Mathur (BN) and Rajore (RB). **Process alternatives for lactose hydrolysis.** *Indian Dairyman* 43(9); 1991; 394-402

Various process available for the hydrolysis of lactose have been described. These include reaction mechanism, hydrolysis of lactose by inorganic/organic acids, application of cationic resins for hydrolysis in deproteinised whey, use of

lactose obtained from mold, yeast and bacteria; and use of immobilized enzymes. Application of hydrolysed whey as base material and ingredient in the industry is also indicated. SRA

109

Madhava Rao (T), Jairam (BT), Laxminarayana (M) and Krishna (N). **Studies on the quality of casein-soya protein incorporated rennet curd (coagulum).** *Journal of Food Science and Technology (India)* 28(5); 1991; 321-322

The effect of casein and soya protein mixture on various physico-chemical characteristics of rennet curd was studied. The amount of casein added to the milk in preparation of rennet curd is standardised at 4% level. The results indicated that replacement of 4% casein by soya proteins at 50% level improved the quality and nutritive value of rennet curd suitable for preparation of harder var. of cheeses and replacement at 75% level produced rennet curd of soft nature. AS

110

Suwardi (H). **Dairy industry development in Indonesia.** *Indian Dairyman* 43(3); 1991; 126-132

History of dairy development, dairy development policy, the integrated approach for national dairy development, small-holder dairying, dairy industry development achievement, and future development in Indonesia have been covered. SRA

111

Masood Ahmed. **Pakistan's dairy industry.** *Indian Dairyman* 43(3); 1991; 137-138

This article considers briefly milk production, consumption, milk processing, constraints facing the UHT milk industry (over capacity, high packaging cost, competition from raw milk, import duties on the skim milk powder, unrealistic milk standards, poor product image, raw milk procurement, seasonality and powdered milk production), and milk products of Pakistan. SRA

112

Walstra (P). **On the stability of casein micelles.** *Journal of Dairy Science* 73(8); 1990; 1965-1979

113

Turk (RS), Watkins (AS) and Blair (GT). **Differential thermal inactivation analysis of calf rennets.** *Journal of Dairy Science* 73(8); 1990; 2000-2006

A differential thermal inactivation method is used to determine the relative proportions of chymosin and

bovine pepsin in commercial calf rennet extracts. The stability of these enzymes is investigated under various conditions of elevated pH, temp. and ionic strength. Chymosin is thermally inactivated by a first order process and at a much slower rate than pepsin. An algorithm is presented for calculating the ratio of enzymes from three measurements of milk clotting activity. The rate constant of chymosin inactivation can also be determined. The method is rapid and suitable for testing in-process samples. It also provides accuracy comparable to the reference method, which requires dialysis of the rennet followed by separation of the proteins. AS

Milk

114

Misra (AK) and Kuila (RK). **Bifidus milk: A potential for developing countries.** *Indian Dairyman* 43(9); 1991; 390-393

Fermented milk containing bifidobacteria has preventive and curative properties in the intestine especially for children and aged. The biological activities, role of bifidobacteria, preparation of bifidus milk, antimicrobial activity and therapeutic properties are summarised. Consumption of bifidus milk with high numbers (10^8 cfu/g) of this organism will provide L (+) lactic acid, antibiotic factor and live bifidobacteria in addition to other nutritional components. The combined action of these factors will create favourable conditions for the proliferation of intestinal bifidobacteria and discourage the growth of harmful organisms. SRA

115

Khedkar (CD), Dave (JM) and Sannabhadti (SS). **Inhibition of growth of pathogenic bacteria during production and storage of acidophilus milk.** *Journal of Food Science and Technology (India)* 28(5); 1991; 271-273

Enterotoxigenic *Staphylococcus aureus* and mastitic *Escherichia coli* were grown individually in milk in the presence of *Lactobacillus acidophilus* LBKV 3 at 37 C. *L. acidophilus* restricted the growth of *Staph. aureus* after 16 h and that of *E. coli* after 60 h. When the cultures were subsequently stored at 15 C after incubation for 12 h at 37 C, the inhibition of *Staph. aureus* was observed after 4 h while the inhibition of *E. coli* was observed after 36 h. AS

116

Pagliarini (E), Vernile (M) and Peri (C). **Kinetic study on colour changes in milk due to heat.** *Journal of Food Science* 55(6); 1990; 1766-1767

117

Prajapathi (JB) and Dave (RI). **Application of lactoperoxidase system for enhancing the shelf-life of milk.** *Indian Food Industry* 9(6); 1990; 37-39

Article briefly describes the components of LP system (lactoperoxidase, thiocyanate, hydrogen peroxide), application in milk, effect of LP system on pathogens and starter bacteria, evaluation of LP treated milk for product manufacture, control of usage of LP system. SRA

118

Kochhar (A), Bajaj (S) and Hira (CK). **Utilization of iron from cereal-legume diets supplemented with milk.** *Indian Journal of Dairy Science* 43(1); 1990; 56-59

Eight adult males were fed six cereal-legume diets at 43 and 51 g of protein levels supplemented with 50, 200 and 350 ml of milk for a period of 11 days each. Samples of food, faeces and urine were collected for the last 4 days and analysed for Fe. The increase in protein content of the diets resulted in a significant increase in Fe absorption and retention. Supplementation of milk to cereal-legume diets at a level higher than the recommended intake did not significantly affect Fe absorption and retention in human subjects. AS

119

Manjunath (GM) and Bhat (GS). **Studies on native proteinase activity in milk (native proteinases in milk).** *Indian Journal of Dairy Science* 43(1); 1990; 102-104

The native proteinase activity in cow and buffalo milk was determined by estimating increase in non-protein nitrogen (NPN) during incubation of milk at 37 C. The milk from cross bred cows and buffaloes showed about 68.5 mg/l and 55 mg/l of increase in NPN indicating higher native proteinase activity in milks from Indian Dairy Farms. Colostrum showed high level of proteinase activity. However it increased once again during late lactation. The native proteinase activity was mostly confined to plasma phase. Casein Micellar dispersion showed about 67% and ultra centrifugal serum contained about 33% of total native proteinases activity in milk. AS

120

Tzeng (WC) and Zall (RR). **Combining polymers with chemical, thermal and turbulent conditions to clean an ultrafiltration membrane fouled with milk.** *Process Biochemistry* 25(3); 1990; 71-78

An ultrafiltration system fouled by skim milk and whole milk was used as a model system in this study. Three variables: temp., NaOH concn. and pressure difference were used to represent thermal, chemical and turbulent conditions resp. The results show that the flux of the fouled membrane can only be partially restored for both skim milk and whole milk operations using NaOH solution. Within the study range, the optimal conditions for flux restoration of skim milk are $T = 112\text{ F}$, $C = 0.9\%$, and $\delta P = 15\text{ lb in}^{-2}$. For whole milk, the flux recovery is proportional to temp., independent of pressure difference, and with optimal concn. of NaOH solution at 0.8%. The max. flux recovery predicted is about 68% for both skim milk and whole milk. By adding 0.003% carboxymethyl cellulose in 0.5% NaOH solution, the flux recovery for both skim and whole milk was slightly improved. The observations of cleaning and rinsing behaviour during cleaning of the fouled membrane using polymers suggest that the mechanical scrubbing effects resulted from the random motion of polymer molecules in the cleaning solution might be responsible for enhancement of cleaning efficiency. AS

121

McKenna (AB) and Singh (H). **Age gelation in UHT-processed reconstituted concentrated skim milk.** *International Journal of Food Science and Technology* 26(1): 1991; 27-38

UHT reconstituted concentrated skim milks made from high-heat powder had considerably longer gelation times than those made from medium- or low-heat powders. Addition of hexametaphosphate to the concentrated milk before UHT processing markedly delayed the onset of gelation during storage. Sediment formation was greatest in the UHT concentrated skim milk made using high-heat powder followed by samples made using medium- and low-heat powders, resp. The extent of proteolysis, as measured by 12% TCA-soluble amino groups, increased at a faster rate in the UHT milks stored at 40 C than in those stored at 22 C but decreased with increasing heat treatment of the milk prior to powder manufacture. The electrophoretic patterns of samples stored at 22 C clearly showed the breakdown of β -casein with a corresponding increase in slower moving bands, presumably γ -casein and proteose-peptone components. However, storage of samples at 40 C resulted in diffused 'blurred' protein patterns with some protein material not entering the resolving gel. At 22 C there was some evidence of proteolysis but no evidence of high mol. wt. polymer formation, while at 40 C both proteolysis and high mol. wt. polymer formation increased with storage time. It appeared that both physico-chemical and proteolytic processes play some part in the mechanism of gelation in UHT reconstituted concentrated skim milk. AS

122

Kim Ha (J) and Lindsay (RC). **Method for the quantitative analysis of volatile free and total branched-chain fatty acids in cheese and milk fat.** *Journal of Dairy Science* 73(8): 1990; 1988-1999

Volatile free fatty acids ($< C_{12}$) in Parmesan cheese and milk fat were extracted with diethyl ether hexane, adsorbed on neutral alumina, eluted from alumina with formic acid in diisopropyl ether, and separated from long-chain fatty acids by simultaneous distillation-extraction. Volatile branched-chain fatty acids in total lipid extracts were isolated similarly after alkaline hydrolysis. Butyl esters of isolated fatty acids were prepared, extracted into pentane, washed with methanol: water, and analyzed on a bonded polyethylene glycol (Supelcowax 10) capillary column. Esters of fatty acids were identified by gas chromatography mass spectroscopy and were quantified by GC using 2-ethyl-nonanoic acid as an internal standard. In addition to the usual even carbon-numbered FFA, 2-methylbutanoic, 3-methylbutanoic, 2-ethylbutanoic, pentanoic, 3-methylpentanoic, 4-methylpentanoic, 2-ethylhexanoic, 4-methylhexanoic, heptanoic, a methylhaptanoic, an ethylheptenoic, 4-ethylhaptanoic (or 3-methyloctanoic), 4-methylcatanoic, a methyloctanoic, nonanoic, 4-methylnonanoic, 8-methylnonanoic, 2-ethyldecanoic, and 9-decenoic acids were identified and quantified. Substantial reservoirs of volatile branched-chain, odd carbon-numbered, and unsaturated fatty acids occur in cow's milk fat. AS

Milk products

123

Parthasarthy (S). **Policy support for developing and marketing of indigenous milk products.** *Indian Dairyman* 43(3): 1991; 111-115

The pattern of consumption of milk and milk products in India by different expenditure classes including the % of total expenditure both by urban and rural families; annual growth rate of private consumption on selected items; classified list of indigenous dairy products; and development of efficient processes and this adoption, aspects of packaging and maturity and standardisation of quality and machinery and know-how are covered. KAR

124

Haque (SA). **Indigenous milk products of Bangladesh.** *Indian Dairyman* 43(3): 1991; 116-119

125

Patel (RK). **Indigenous milk products of India.** *Indian Dairyman* 43(3); 1991; 120-125

Aspects covered in this article include the milk utilization pattern, Indian indigenous milk products (Heat desiccated products: khoa, rabri, khurchan, pyodhi; heat/acid coagulated products: paneer, chhana; fermented products: dahi, mishti doi, chakka, srikhand, lassi, mattha; Fat rich products: ghee, makkan; cereal based products: kheer, pysum; Milk sweets/delicacies: burfi, kalakand, peda, gulabjamun, rasogolla, sandesh, rosmalai), current status of industry (khoa, paneer, chhana, ghee, dahi, milk sweets) and planning for the future. SRA

126

Thakur (BN), Acharya (RC) and Shrestha (KG). **Indigenous dairy products of Nepal.** *Indian Dairyman* 43(3); 1991; 133-136

Livestock and its place in economy, dairying in Nepal, indigenous Nepali's dairy products (khoa, chhana and paneer, ghee, sherkum and chhurpi), constraints and research aspects are briefly described. SRA

127

Saludares (LN). **The Philippine dairy industry: Focus on indigenous milk products and dairy development.** *Indian Dairyman* 43(3); 1991; 139-142

Status of the industry, historical background of indigenous milk production (native white cheese, leche plain-milk with egg, pastiusas de leche-milk with sugar, frozen milk delight-frozen milk with sugar and young coconut, maja blanca-ground rice with milk and sugar cooked), constraints to dairy development (uncertainty of funding source and inadequate budget releases to support the development, small dairy base herd, multinational milk companies control milk market, uncertainty of development policy direction and wavering political resolve to develop the dairy development (holistic approach to dairy development, the use of successful livestock and poultry cooperatives that have been in the business for yrs, producing eggs, broilers, pigs and cattle, the use of multi-purpose cooperatives as conduits, training coop. members in A.I. and para veterinary services, development of suitable milk products, and market assurance for locally produced milk) are the aspects covered. SRA

Cheese

128

Puchades (R), Lemieux (L) and Simard (RE). **Determination of free amino acids in cheese by flow injection analysis with an enzymic reactor and chemiluminescence detector.** *Journal of Food Science* 55(6); 1990; 1555-1558, 1578

The substrate is degraded enzymatically by L-amino acid oxidase immobilized on controlled porosity glass. The hydrogen peroxide generated by the reaction is determined by chemiluminescence with an alkaline reagent containing luminol and hexacyanoferrate (III). The log-log calibration graphs for L-leucine were rectilinear from 0.025 mM to 1.0 mM ($R = 0.9998$). The coeff. of variation (rds) for $n = 10$ were 1.4% and 0.3% for 0.1 mM and 0.8 mM of L-leucine, resp. The sample throughput was 40 h^{-1} . The concn. of free amino acids in cheese samples was 14 - 50 mg L-leu/g product. The enzyme reactor showed good stability over 4-months. AS

129

Ladkani (BG) and Srinivasan (MR). **Changes in flavour compounds of emmental type cheese from buffalo milk.** *Indian Journal of Dairy Science* 43(1); 1990; 99-101

During ripening, the changes in flavour compounds were studied in the samples processed under different conditions. On ripening, the samples processed under different conditions contained 10.9, 8.8 and 10.1 total free fatty acids ($\mu \text{ Moles/g}$ of fat) 5.6, 4.65 and 5.13 total volatile fatty acids (0.1N NaOH/100g cheese) and 9.66, 8.29 and 9.24 total carbonyl contents ($\mu \text{ Moles/g}$ of fat) in cow, buffalo and mixed milk cheese sdamples resp. Generally, flavour compounds were found increasing in cheese samples on ripening. However, cow milk cheese was rated better than buffalo and mixed milk cheese samples. In general, the cheese samples obtained from HTST, pasteurized milk had max. flavour compounds than the samples obtained from LTLT pasteurized milk. AS

130

Kumari (S) and Singh (S). **Factors affecting proteolysis in soy cheese slurries.** *Indian Journal of Dairy Science* 43(1); 1990; 105-111

In order to determine the profile of proteolytic changes the soy cheese slurried were analysed by disc electrophoresis during storage at 30 C for about a wk. In addition the samples were also analysed for the free amino-groups, free amino acids and exposure of active -SH groups. The electrophoretic pattern showed that the fresh soy-slurries contained only 4 fractions, the number of which increased as the ripening progressed. The concn. of free amino groups increased with the advance of ripening and

was affected by agitation, culture, rennet, papain, pH control and incorporation of additives. The fresh soy-slurries contained 0.75 mg of free amino groups/g which increased up to 6.26 mg. The liberation of free amino acids increased with the storage period both qualitatively and quantitatively. The number and concn. of free amino acids were dependent on types of treatments given to the slurries. The fresh slurries contained only 8 free amino acid which increased upto 13 on 4th day. The formation of active -SH groups was related to various treatments, viz. culture, rennet/papain and additives. The concn. of -SH groups related directly to the flavour quality of the product. There was almost, negligible production of -SH groups during first 3 days followed by fluctuation up to 5th day. Thereafter the concn. increased up to the end of storage. AS

Cheddar cheese

131

Lemieux (L), Puchades (R) and Simard (RE). **Free amino acids in Cheddar cheese: Comparison of quantitation methods.** *Journal of Food Science* 55(6); 1990; 1552-1554

Two reported methods were compared with a more rapid and accurate flow injection analysis (FIA) technique. A trinitrobenzenesulfonic acid (TNBS) method provided absolute values, was tedious, and the reagent was light-sensitive and required heating. An O-phthalaldehyde (OPA) method was faster and less variable than the TNBS, but reaction time had to be carefully controlled. The results with the OPA correlated well with the TNBS but were overestimated due to reading small peptides and ammonium ions. The FIA method was simple and reliable, yielded values which correlated closely with amino acids and gave information about degree of proteolysis. AS

132

Subramanian (P), Malik (RK) and Mathur (DK). **Bacteriological changes during ripening of buffalo milk Cheddar cheese.** *Indian Journal of Dairy Science* 43(1); 1990; 86-89

Changes in bacterial counts during ripening of Cheddar cheese is described. The difference between total viable and lactic acid bacterial counts was not significant during cheese ripening irrespective of type of milk (Cow or Buffalo milk) and the starter culture used (LF - 40 and CH - 9). Increase in the micrococcal count in the first one month and a gradual decline during the subsequent ripening period was observed both in cow and buffalo milk Cheddar cheese prepared with the two cultures. The proteolytic bacteria in LF - 40 buffalo

milk cheese were detectable only after one month of ripening and were again absent in 12 months ripened cheese. In CH - 9 cow milk cheese also, these organisms first appeared after 3 months of ripening, increased in numbers upto 6 months and thereafter declined. AS

133

Kanawjia (SK) and Singh (S). **Effect of lipase addition on enhancement of flavour and biochemical changes in buffalo milk Cheddar cheese.** *Indian Journal of Dairy Science* 43(1); 1990; 90-94

Attempts were made to enhance the flavour development in buffalo milk Cheddar cheese by using lipase enzyme. Three levels of enzyme, viz., 0.0005, 0.001 and 0.005% of cheese curd were used. The study revealed that the flavour development in experimental cheeses were quicker than the control. The addition of 0.001% lipase yielded the best Cheddar cheese as compared to other levels. The max. flavour was attained within 6 months of curing. The highest dose of enzyme resulted in rancid flavours, whereas, the lowest dose had little effect on flavour development. The free fatty acid content was comparatively higher in all the experimental cheese. The lipolysis in cheese was positively related with levels of enzyme addition and curing period. AS

134

Foster (SJ), Baer (RJ) and Mistry (VV). **Cheddar cheese manufactured from condensed milk.** *Journal of Dairy Science* 73(8); 1990; 1980-1987

The effect of condensing milk by evaporation on Cheddar cheese comp., yield, and quality was studied. Milk fat globules increased in number and decreased in size in whole condensed milk indicating a partial homogenization effect. Small fat globules (< 2 µm) increased in number in separated condensed milks; however, large fat globule numbers did not change. Cheddar cheese made from whole condensed milk had greater fat retention in curd and less fat loss in whey than cheeses made from whole, separated, or separated condensed milks. Cheese made from whole condensed milk was curdy in body and texture at 1 month of age, but this defect disappeared during aging. The major benefit to the manufacturer of condensing milk would be more efficient utilization of existing equipment. AS

Mozzarella cheese

135

Ghosh (BC) and Singh (S). **Effect of storage temperatures on sensory, chemical and**

rheological characteristics of Mozzarella cheese. *Journal of Food Science and Technology (India)* 28(5); 1991; 288-292

Mozzarella cheese prepared from buffalo milk and packed in polyethylene pouches was acceptable upto a period of 14 and 90 days when stored under refrigerator (8 to 9 C) and deep-freeze (-10 to -15 C) resp. During storage there was a continuous moisture loss and so also a decrease in the pH levels of the cheese. The values of titratable acidity (TA) and soluble protein showed an increase during storage. The multiple regression analysis revealed that TA and soluble protein were responsible for 96% of variation in flavour characteristics of cheese stored in refrigerator. All the textural characteristics decreased with increase in storage period at both the temp. except adhesive force. AS

136

Ghosh (BC), Singh (S) and Kanawjia (SK). **Rheological properties of mozzarella cheese - A review.** *Indian Journal of Dairy Science* 43(1); 1990; 71-80

This review covers effect of manufacturing conditions on mozzarella cheese (addition of starter culture, direct acidification of milk, renneting of milk, cutting, cooking, cheddaring, stretching, cooling and salting), meltability and texture. 62 references. BV

Ice cream

137

Sarada (M) and Mushtari Begum (J). **The microbiological quality of ice creams sold in Bangalore city.** *Journal of Food Science and Technology (India)* 28(5); 1991; 317-318

The bacteriological quality of ice creams and water ices which are referred as lollies sold in Bangalore city was examined. 120 samples of ice creams in cups, cones, bars and lollies from hotels, parlours and local vendors were assessed for standard plate count and coliforms. Microbiologically, no significant differences were found between samples from hotels, parlours and local vendors. The counts were comparatively less in lollies than in icecreams. Out of the total samples collected for the study, only 47 samples for standard plate count and 74 for coliforms were meeting the standards prescribed by Bureau of Indian Standards. AS

138

Cheema (AS) and Arora (KL). **Manufacture of filled ice-cream.** *Indian Journal of Animal Science* 61(3); 1991; 316-323

Filled ice-creams were manufactured using groundnut, soybean- and corn-oils, 0.3 and 0.4% sodium alginate and 0.80, 0.10 and 0.12% Tween-80 so as to contain 10% SNF and 15% cane sugar. Control ice-cream was manufactured from milk-fat so as to contain 10% fat, 12% SNF and 15% cane sugar, 0.3% sodium alginate and 0.06% Tween-80. Standard manufacturing procedure was adopted with some modifications. The values of surface tension, relative viscosity, melting rate and pH of all types of filled ice-creams/mixes were almost in the same range as those of the control. However, whipping ability of the mixes was much lower and free fat higher than those of the control ice-cream. All types of filled ice-creams containing 0.3% sodium alginate and 0.10% Tween-80 were comparable to control ice-cream in sensory qualities. AS

Paneer

139

Mathur (BN), Zanjad (PN) and Rao (KVSS). **Paneer and tofu: An appraisal of product and process synergies.** *Indian Dairyman* 43(9); 1991; 407-413

Article describes the composition and quality attributes of *tofu* (a soybean curd) which is similar to *paneer* in India, a popular food in Japan, China and other South Asean countries. *Paneer* and *tofu* are nutritious product but have short shelf-life. There are different kinds of *tofu* due to differences in the manufacturing method, and the type of coagulant used. Current manufacturing method for *tofu* and *paneer* and the equipment used for *tofu* manufacture are described. SRA

140

Sachdeva (S) and Singh (S). **Shelf-life of paneer as affected by antimicrobial agents. Part 1. Effect on sensory characteristics.** *Indian Journal of Dairy Science* 43(1); 1990; 60-63

Attempt was made to extend the shelf-life by dipping paneer in treated water prior to its packaging. Dipping of paneer in chlorinated water (35 p.p.m.), buffered water (pH 7.5) and acidified water (pH 5.5 and 2.5) did not help in improving the shelf-life, rather had an adverse effect. Dipping of paneer in brine (5%) not only improved the shelf-life markedly, but also made it more palatable. Treatment with 2% potassium sorbate solution was of no avail. Higher levels imparted an unclean sorbate smell and a slight amount of bitterness to the product. Paneer treated with delvocid did not show any sign of improvement in its shelf-life. On dipping paneer in hydrogen peroxide solution (0.2%), the shelf-life was extended upto 22 days. A mouldy flavour developed

thereafter rendering the product unacceptable. The fungicide (delvocid) when used in combination with a germicide (hydrogen peroxide) gave excellent results and paneer thus treated kept good for a period of 32 days at 8 - 10 C. AS

141

Sachdeva (S) and Singh (S). **Shelf-life of paneer as affected by antimicrobial agents. Part II. Effect on microbiological characteristics.** *Indian Journal of Dairy Science* 43(1); 1990; 64-66

The total plate count, the yeast and mould count and the coliform count of paneer treated with different dipping materials were determined during storage. The fresh paneer had a total plate count of 10^1 to 10^3 /g which increased to the number of 10^4 to 10^6 /g regardless of treatment. The treatment with hydrogen peroxide had the max. bactericidal effect. The initial yeast and mould count of fresh paneer ranged from 6×10^1 to 52×10^1 /g which increased during storage reaching final values on the order of 36×10^1 to 63×10^3 /g. The treatment with delvocid was most effective in inhibiting the growth of yeasts and moulds. The coliform counts were negligible. AS

142

Sachdeva (S) and Singh (S). **Shelf-life of paneer as affected by antimicrobial agents. Part III. Effect on chemical characteristics.** *Indian Journal of Dairy Science* 43(1); 1990; 67-70

The chemical changes occurring in paneer treated with different dipping materials were determined during storage at 8 - 10 C. The initial pH of paneer was in the range of 5.77 - 6.03 which tended to rise at least up to 6 to 7 days. The initial acidity of fresh paneer was about 0.20% which increased gradually in the beginning followed by sharp increase towards the end of storage. The initial soluble protein content was about 0.10% which increased sharply during storage. The electrophoretic analysis showed that the α -s and β -casein degraded into several faster moving bands indicating a high degree of proteolysis during storage. AS

Wheys

143

Patel (RS), Jayaprakasha (HM) and Singh (S). **Recent advances in concentration and drying of whey.** *Indian Dairyman* 43(9); 1991; 417-421

Whey has been produced in large quantities by Indian dairies. As it possesses good functional and nutritional properties, it could be converted to powder and could be used in beverages, soups,

sauces, gravies, frozen desserts, yoghurt, cheese, cheese spreads and infant foods. Conc. of whey initially by reverse osmosis is economical and energy saving method which could be followed by spray drying. The properties of whey conc. and the procedure for pre-crystallisation and its properties have been described. The belt process and the filtermat concept are the aspects covered in this article. SRA

144

Gonzalez (JM) and Damodaran (S). **Recovery of proteins from raw sweet whey using a solid state sulfitolysis.** *Journal of Food Science* 55(6); 1990; 1559-1563

A simple, efficient method to recover functional protein from cheese whey was developed. It involves partial sulfitolysis of disulphide bonds in whey proteins using sodium sulphite and solid state copper carbonate catalyst. About 25 to 40% of the initial disulphide bonds were modified within 15 to 30 min at pH 7.0. When treated whey was adjusted to acidic pH, about 70 to 80% of the whey proteins precipitated below pH 5.0. The protein precipitate contained some copper as protein copper complex. However, extraction of the precipitate with EDTA at pH 4.5 completely removed the Cu. The uncomplexed protein showed a U-shaped pH-solubility profile with 100% solubility below pH 3.0 and above 6.0. About 90% of the proteins precipitated in the pH range 4.0 - 5.0. The method could be used on an industrial scale to recover highly functional and nutritional whey protein for use in a variety of products. AS

MEAT AND POULTRY

145

Shackelford (SD), Reagan (JO), Haydon (KD) and Miller (MF). **Effects of feeding elevated levels of monounsaturated fats to growing-finishing swine on acceptability of boneless hams.** *Journal of Food Science* 55(6); 1990; 1485-1487, 1517

146

Autio (K) and Mietsch (F). **Heat-induced gelation of myofibrillar proteins and sausages: Effect of blood plasma and globin.** *Journal of Food Science* 55(6); 1990; 1494-1496, 1539

147

Shackelford (SD), Miller (MF), Haydon (KD) and Reagan (JO). **Effects of feeding elevated levels of monounsaturated fats to growing-finishing swine on acceptability of low-fat sausage.** *Journal of Food Science* 55(6); 1990; 1497-1500

148

Ito (T), Yoshida (S), Kamisoyama (H) and Tanaka (H). **Electrolytic reduction of heme proteins: Attempt to prepare stable natural colourant for sausage.** *Journal of Food Science* 55(6); 1990; 1689-1695

149

Rao (DN), Vasudeva (RY), Haleem (MA), Nagaraju (V) and Modi (VK). **Rendering of animal by-products.** *Indian Journal of Meat Science and Technology* 3(1); 1990; 63-73

Indian meat industry has good potentials for the recovery and utilisation of animal by-products which fetch 10 - 15% of the value of live animal. When these by-products are converted into value end products, the end products may fetch prices 10 - 15 times that of the by-product. The paper highlights the importance of inedible by-products, rendering process and a model design for rendering plant. AS

150

NPC Pollution Control Division. **Pollution from slaughter houses. Cost implications for abatement and control.** *Productivity* 31(2); 1990; 310-311

Meat

151

Krishnan (KR) and Sharma (N). **Studies on the quality characteristics of buffalo skeletal, offal meats and their combinations.** *Journal of Food Science and Technology (India)* 28(5); 1991; 304-307

Rumen meat (RM) had significantly higher pH (6.95) followed by heart meat (HM) and skeletal meat (SM) in decreasing order. The colour score was the lowest for RM followed by SM and HM in an increasing order. The water holding capacity (WHC, 3.27 sq. cm) and moisture content (80.93%) were significantly higher in RM than in SM and HM. The total protein (20.32%) and extractable proteins (EP, 56.07%) were significantly higher in SM. Between offal meats, RM had higher EP and lower salt soluble proteins (SSP) than HM. Regarding the emulsifying capacity (EC), the RM and HM were almost identical. Significant differences were observed in EC ($P < 0.05$), moisture ($P < 0.01$) and total protein ($P < 0.01$) percentages in the different raw meat combinations, SM:OM. Higher EC was observed in 100:00 combination (107.17 ml/2.5 g) and lowest in 70:30 combination (100.33 ml/2.5 g) and reverse proportions of moisture percentages in 100:00 (76.92) and in 70:30 (78.07) were observed. Highest

total protein percentage was registered by 100:00 followed by 90:10, 80:20 and 70:30 combinations in a decreasing order. The results indicate that buffalo SM and OM in various combinations may be commercially utilised in the preparation of comminuted meat products. AS

152

Akamittath (JG), Brekke (CJ) and Schanus (EG). **Lipid oxidation and colour stability in restructured meat systems during frozen storage.** *Journal of Food Science* 55(6); 1990; 1513-1517

153

Prasad (RL) and Singh (LN). **Comparative distribution of stroma proteins in cardiac, smooth and skeletal muscles from buffalo, rabbit, chicken and fish.** *Indian Journal of Meat Science and Technology* 3(1); 1990; 22-28

154

Keshri (RC) and Sharma (N). **Sensory quality of soup processed with goat and buffalo bones.** *Indian Journal of Meat Science and Technology* 3(1); 1990; 54-57

Sensory quality of soups prepared by simmering (temp. 70-75 C, time 6 h) and pressure cooking (Pr. 1.05 Kg/cm², time 1.5 h, temp. 121 C) of fresh and chill stored (4 plus or minus 1 C) bones from goat and buffalo are reported. Scores on appearance, flavour, taste and overall acceptability suggested that simmering was a better method of processing bones for soup than that of pressure cooking. Scores of soup prepared from fresh bones were superior to the chill-stored bones. The flavour, taste and overall acceptability scores of soup prepared from chill stored buffalo bones (4 plus or minus 1 C for 6 days) by pressure cooking were significantly lower ($P < 0.05$) and did not yield satisfactory results. AS

155

Haleem (MA), Modi (VK), Nair (RB), Puttarajappa (P) and Rao (DN). **Preservation of meat.** *Indian Journal of Meat Science and Technology* 3(1); 1990; 74-86

The recognised methods of meat preservation are by chilling, freezing, drying, curing, smoking, canning and by incorporating additives. Technological aspects of preservation methods have been discussed in relation to meat quality and safety. Recent advances in microwave cooking and irradiation of meat have also been described. AS

Beef

156

Angelo (AJSt), Crippen (KL), Dupuy (HP) and James (CJr). **Chemical and sensory studies of antioxidant-treated beef.** *Journal of Food Science* 55(6); 1990; 1501-1505, 1539

Ground beef patties treated with metal chelators, free radical scavengers, rosemary and sodium alginate were examined by chemical (TBARS and gas chromatography) and sensory means in regard to warmed-over flavour (WOF). A highly trained analytical sensory panel evaluated the patties for desirable descriptors, such as cooked beef broth (CBB) and for WOF descriptors, painty and cardboardy. Results showed many of the compounds retarded lipid oxidation when judged by chemical means, but not all affected development of WOF when judged by sensory means since CBB values decreased and WOF descriptors increased. The free radical scavengers appeared overall the most effective inhibitors of WOF. AS

157

Gruber (HA), Kronick (PL), Buechler (PR) and Hannigan (MV). **Determination of connective-tissue components in beef using simultaneous equations based on amino-acid analyses.** *Journal of Food Science* 55(6); 1990; 1506-1509

158

Farouk (MM), Price (JF) and Salih (AM). **Effect of an edible collagen film overwrap on exudation and lipid oxidation in beef round steak.** *Journal of Food Science* 55(6); 1990; 1510-1512, 1563

This study has been undertaken to determine the reduction of exudation in beef round steaks without affecting their colour and TBA number, by using an edible collagen film (Coffi) overwrap. Exudation was minimized without affecting the colour by wrapping steaks with Coffi film. Vacuum packaging caused more exudation compared to tray packaging with PVC, which resulted in more desirable colour than vacuum packaging. BV

159

Seman (DL) and Moody (WG). **Characteristics of beef batters as influenced by electrical stimulation and postmortem salting time.** *Journal of Food Science* 55(6); 1990; 1518-1522, 1548

160

Darmadji (P), Izumimoto (M), Miyamoto (T) and Katoaka (K). **Lactic fermentation effects on preservative qualities of dendeng giling.** *Journal of Food Science* 55(6); 1990; 1523-1527

Model, "Dendeng giling", Indonesian non-fermented dried beef, was prepared after fermentation with *Lactobacillus plantarum* as starter and compared with control without starter culture. Inoculated sample was fermented at 30 C for 16 h. *Lactobacillus* grew from 10^6 to 10^8 , pH went from 5.71 - 5.2. *Micrococcus*, Gram-negative bacteria, *Pseudomonas*, *Staphylococcus*, and *Escherichia coli* were inhibited by 98.3, 77, 93, 96 and 77% after fermentation for 16 h. Inoculated samples were tested for inhibiting volatile base nitrogen and thiobarbituric acid value dissipating residual nitrite and development of redness. Lower pH caused faster drying at 50 C and reduced water activity. The combination of low pH and water activity made possible improvement of preservative quality. AS

161

Sheard (PR), Foster-Smith (A) and Jolley (PD). **Factors influencing the particle size distribution of flaked meat. II. Effect of aperture size, number of cutting stations, rotational speed and impeller design.** *International Journal of Food Science and Technology* 26(1); 1991; 65-81

Mutton

162

Shaikh (NS), Sherikar (AT), Bhilegaonkar (KN) and Karkare (UD). **Studies on preparation of mutton sausages.** *Journal of Food Science and Technology (India)* 28(5); 1991; 323-325

Twelve batches of mutton sausages were prepared from recipes containing various formulations of the ingredients. Sheep meat allowed incorporation of hydrogenated vegetable oil in sausage mix giving better stability to emulsion. The sensory evaluation indicated that the batch with higher contents of spices was superior than other batches in overall quality. The total viable count studies revealed that the sausages can be preserved at refrigeration temp. (7 plus or minus 1 C) for 3 days. AS

163

Prasad (VSS). **Meat yield from culled sheep and the quality of ready-to-eat mutton blocks.** *Indian Journal of Animal Science* 60(2); 1990; 249-250

164

Mohan Raj (AB), Ramaswami (AM) and Ramamurthi (R). **Moisture conservation in cold stored mutton**

by cetyl alcohol glycerine emulsion coating. *Indian Journal of Meat Science and Technology* 3(1); 1990; 29-35

Fourteen muscle *Longissimus dorsi* samples were coated with cetyl alcohol glycerine emulsion and stored at chilling (5 plus or minus 1 C) and freezing (-3 plus or minus 1 C) temp. with respective controls. Muscle pH, water-holding capacity, extract release volume, tyrosine value and thiobarbituric acid number were studied at fresh (4 h post-mortem), 24, 48 and 72 h post-mortem after storage. Moisture content was also determined at fresh state and after 72 h of storage at both the temp. The results showed that coating of cetyl alcohol on the surface of meat helped to retain 2.13 and 2.30% of moisture at chilling and freezing temp. resp. The other parameters studied revealed that cetyl alcohol coating did not interfere in anyway with the meat quality. AS

165

Eswara Prasad (P) and Krishna Reddy (K). **A comparative study of carcass characteristics in normal and cryptorchid Mandya lambs.** *Indian Journal of Meat Science and Technology* 3(1); 1990; 50-62

The birth wt., weaning wt. and wt. at 180 days of age of 5 cryptorchids and 8 normal Mandya lambs were compared. The normal lambs recorded a significantly higher ($P < 0.01$) wt. at all stages of growth. The carcass characteristics of cryptorchids have shown a significantly higher ($P < 0.01$) dressing percentage compared to normal lambs. The loin eye area of 7.5 cm^2 was recorded in cryptorchids compared to 8.0 cm^2 in ram lambs. The proximate comp. of longissimus dorsi (LD) and semitendinosus (ST) of cryptorchids revealed significantly higher ($P < 0.01$) fat 4.31% as against 3.38% in normal lambs. The pH values of meat before and after chilling were 6.76; 5.54 and 6.6; 5.9 for the cryptorchids and normals resp. The shear force value of LD (3.40) and ST (3.19) muscles of cryptorchids were significantly lower than those of normal lambs (3.79 and 3.43). AS

Pork

166

Ibrahim N, Unklesbay (N), Kapila (S) and Puri (RK). **Cholesterol content of restructured pork/soy hull mixture.** *Journal of Food Science* 55(6); 1990; 1488-1490

The effect of 30 time-temp. conditions on the cholesterol and cholesterol-oxide content of a restructured pork/soy hull mixture has been studied. No cholesterol oxides were found at 2

p.p.m. in the product with any of the 30 time-temp. profiles, ranging from 19 - 89.6 min of convective heat processing, and 9 - 97 C final product temp. Cholesterol in heat-processed samples ranged from 45.43 - 66.47 mg/100 g. Positive correlations were found between final temp. and fat and cholesterol content. BV

167

Muzilla (M), Unklesbay (N), Unklesbay (K) and Helsel (Z). **Effect of moisture content on density, heat capacity and conductivity of restructured pork/soy hull mixtures.** *Journal of Food Science* 55(6); 1990; 1491-1493

Moisture content of restructured pork/soy hull product varied (74 - 85%) by the incorporation of hydrated, processed (lignin-reduced) or unprocessed soy hulls using two particle sizes. Thermal diffusivity values were affected the most ($1.14 - 2.01 \times 10^{-7} \text{ m}^2/\text{sec}$) by moisture, followed by heat capacity (2.75 - 4.18 J/g C), and thermal conductivity ($4.80 - 5.72 \times 10^{-3} \text{ W/cm C}$). No significant changes in density was noticed (1.02 - 1.06 g/cm³). BV

168

Sharma (BD), Bachhil (VN) and Bist (GS). **Effect of hot and chilled boning and subsequent storage on the quality characteristics of pork.** *Indian Journal of Meat Science and Technology* 3(1); 1990; 1-9

Rabbits

169

Malik (AH), Keshri (RC) and Sharma (N). **Effects of different levels of hydrogenated vegetable fat in sensory, proximate and cooking quality of rabbit meat patties.** *Indian Journal of Meat Science and Technology* 3(1); 1990; 10-17

An investigation was carried out to study the effect of 0, 5, 10 and 15% level on hydrogenated vegetable fat (HVF) on sensory, proximate and cooking quality of patties prepared from meat of two yrs old New Zealand white rabbits. The overall sensory scores of broiled patties added with 5% HVF were superior to patties with 10 and 15% HVF and control (0%). The overall acceptability scores of patties with 10% HVF were judged between moderately acceptable to very acceptable and with 15% HVF were between slightly acceptable to moderately acceptable. There were significant differences ($P < 0.01$) in the proximate comp. of raw as well as broiled rabbit meat patties due to the levels of HVF. The patties with 5% HVF had 79.2% cooking yield which was significantly higher ($P < 0.01$) than 72.1 and 67.9% cooking yields in patties with 10 and 15% HVF resp. The patties with 5% HVF had significantly lower ($P < 0.05$) than

the values of 19.7 and 23.3% gain in height and 15.7 and 16.7% shrinkage in diameter of rabbit meat patties with 10 and 15% HVF resp. AS

Products

170

Salahuddin (M), Kondaiah (N) and Anjaneyulu (ASR). **Effect of maida, potato and textured soya as binders on the quality of chicken and mutton kababs.** *Journal of Food Science and Technology (India)* 28(5); 1991: 301-303

Effect of incorporation of maida (refined wheat flour 2.5%), potato (10% cooked mince) and textured soya (10% soya nuggets wet mince) as binders on the quality of kababs prepared from total meat components (deboned meat, skin, gizzard, heart and fat) of spent hens and mutton was studied. Emulsion type dough was prepared and kababs were moulded on skewers and charboiled. Inclusion of maida gave significantly better emulsion and contributed to higher yield of kababs. Potato and textured soya produced a lesser but similar effect on emulsion stability and cooking yield. The yields of chicken kababs were 79.40%, 75.90% and 74.97% and mutton kababs were 83.04%, 78.75% and 79.64% in formulations of maida, potato and textured soya resp. Sensory scores of appearance, flavour, juiciness, texture and overall palatability indicated that chicken and mutton kababs with incorporation of the above 3 binders were equally acceptable, there being no significant preferential rating for any of the sensory attributes. Potato incorporated kababs, however, were preferred. Flavour and juiciness seemed to have decided the overall palatability of kababs. The 3 binders could be incorporated in the formulations to produce kababs of good quality and acceptability from chicken and mutton. AS

171

Janssen (FW), Hagele (GH), Voorpostel (AMB) and de Baaij (JA). **Myoglobin analysis for determination of beef, pork, horse, sheep and kangaroo meat in blended cooked products.** *Journal of Food Science* 55(6); 1990: 1528-1530, 1563

172

Velinov (PD), Cassens (RG), Greaser (ML) and Fritz (JD). **Confocal scanning optical microscopy of meat products.** *Journal of Food Science* 55(6); 1990: 1751-1752

This new method allows optical sectioning of thick specimens and thus avoids the potential problem of smearing encountered when fat globules and bacteria are at the surface of sections. BV

Sausages

173

Roncales (P), Aguilera (M), Beltran (JA), Jaime (I) and Peiro (JM). **The effect of natural or artificial casing on the ripening and sensory quality of a mould-covered dry sausage.** *International Journal of Food Science and Technology* 26(1); 1991: 83-89

Poultry

Chickens

174

Self (KP), Nute (GR), Burfoot (D) and Moncrieff (CB). **Effect of pressure cooking and pressure rate change during cooking in vacuum on chicken breast quality and yield.** *Journal of Food Science* 55(6); 1990: 1531-1535, 1551

The effect was studied of processing time, wt. loss, quality, cooking in steam at a pressure of 1.03 or 0.345 bar and cooling at different pressure reduction rate (0.6 to 0.07 bar/min) on chicken breasts quality. Heating time was not affected by cooking pressure but cooling time was reduced as pressure reduction rate increased. Wt. losses varied from 26.4 to 37.7% and increased with severity of temp.-time treatment. Tenderness was not affected by cooking/cooling but juiciness decreased with increased pressure and reduced cooling rate. Juiciness correlated with wt. loss ($r = -0.72$). A 9 member sensory panel indicated harsher temp.-time treatments gave more acceptable meat. AS

175

Ang (CYW), Searcy (GK) and Eitenmiller (RR). **Tocopherols in chicken breast and leg muscles determined by reverse phase liquid chromatography.** *Journal of Food Science* 55(6); 1990: 1536-1539

α -tocopherol (91.2%) and gamma-tocopherol (94.2%) were recovered from both broiler breast and leg muscles (raw or cooked). Leg meat contained almost twice as much total tocopherol as breast meat. This helps in retarding the oxidative changes of cooked leg tissues during post-cooking storage. Cooking had no significant effect on retention of tocopherols on a dry wt. basis for breast or leg meat. BV

176

Xiong (YL) and Brekke (CJ). **Thermal transitions of salt-soluble proteins from pre- and postrigor chicken muscles.** *Journal of Food Science* 55(6); 1990: 1540-1543, 1570

Salt-soluble protein (SSP) was extracted from pre- and postrigor chicken muscles at various pH values, and protein thermal denaturation was studied using several techniques. Heating at 1 C/min from 20 to 70 C induced a three- to fourfold increase in breast and leg hydrophobicity. Differential scanning calorimetry of breast and leg SSP showed a major transition occurring within the range 55 to 64 C, with the value dependent on rigor state and pH. Protein-protein association, as measured by turbidity change upon heating, underwent two transitions for leg SSP and two or three for breast SSP. The specific transition temp. and rate were dependent on pH, muscle type and rigor state. However, muscle type and pH had a greater effect than muscle rigor state on SSP denaturation. AS

177

Xiong (YL) and Brekke (CJ). **Physicochemical and gelation properties of pre- and postrigor chicken salt-soluble proteins.** *Journal of Food Science* 55(6); 1990; 1544-1548

The physicochemical and gelation properties of salt-soluble proteins (SSP) extracted from chicken muscles were studied at 0.6M NaCl, pH 6.00. Thermally induced protein unfolding and protein-protein interaction were determined by 8-anilino-1-naphthalene sulphonate (ANS) fluorescence and turbidity. Breast and leg SSP showed similar changes in protein unfolding, but differed in protein-protein interactions. Postrigor breast SSP formed stronger and more elastic gels than prerigor breast and pre- and postrigor leg SSP. Leg SSP gelation was less affected by muscle rigor state than breast SSP. Protein conformational changes were concluded to precede SSP association, which was a prerequisite for gel formation. AS

178

Anand (SK), Pandey (NK), Mahapatra (CM) and Verma (SS). **Occurrence of enterotoxigenic staphylococci in chicken sausages.** *Indian Journal of Meat Science and Technology* 3(1); 1990; 18-21

Microbiological analysis was carried out on chicken sausages to observe the incidence of enterotoxigenic staphylococci. The av. count of staphylococci was \log_{10} 3.77/g of sausage. A total of 49 staphylococcal isolates were screened for enterotoxin production of type A to E using micro-slide gel double diffusion technique. Among the enterotoxigenic isolates, 66.67% produced enterotoxin A whereas 20.0 and 13.33% produced Ent A and Ent A and B in combination resp. Biochemical characteristics were also correlated with enterotoxigenicity. AS

179

Sekhon (KS) and Bawa (AS). **Effect of extenders on the quality of meat tikkas from culled hens and broiler breeder males.** *Indian Journal of Meat Science and Technology* 3(1); 1990; 36-43

The processing of tikkas from meat of spent hens and broiler breeder males in combination with either of the binders (maida, semolina and potato) as raw or precooked samples was investigated. Cooking loss, shrinkage, protein content and total plate counts decreased with the use of binders. Among the binders, potato containing samples were preferred the least. Cooking resulted in an increase in proteins, fat, salt, dextrose contents and overall acceptability scores but a decrease in moisture content and total plate count. The meat type did not have a marked effect on shrinkage but hen meat tikkas gave higher values for moisture, dextrose, salt content and cooking loss, and lower for protein, fat and total plate counts as compared to broiler tikkas. Hen raw tikkas had higher overall acceptability scores. Cooking improved the sensory quality of tikkas. AS

Duck

180

Sahoo (J). **Influence of sex on meaty cut up parts of desi duck carcasses in Kashmir.** *Indian Journal of Meat Science and Technology* 3(1); 1990; 87-91

The effect of sex on meaty cut up parts of desi duck carcasses was studied. It was observed that the av. wt. (g) of drumstick, thigh and breast cut of male carcasses was more than the female carcasses, the meat content (g) of drumstick and thigh was more in male birds, while that of breast cut was more in female birds, on the other hand all the cut up parts belonging to male birds had more bone content (g). There was no significant difference in the meat % of drumstick (77.09 plus or minus 2.01) and thigh cut (82.88 plus or minus 3.46) of male carcasses as compared to the drumstick (74.12 plus or minus 3.36) and thigh (83.63 plus or minus 2.43) cut of female birds. But the meat % of breast cut (81.49 plus or minus 1.04) of female carcasses was significantly ($P < 0.01$) more than that (74.24 plus or minus 3.87) of male ones. Similar trend was observed in relation to the meat:bone ratio between sexes. Conversely, the breast cut of male birds had significantly ($P < 0.01$) more bone % (25.76 plus or minus 3.88) than female birds (18.51 plus or minus 1.04) whereas, there was no significant variations between them in respect of drumstick and thigh cut. AS

Pigeon

181

Keshri (RC) and Sharma (N). **Fractionation and quantitation of pigeon muscle proteins.** *Indian Journal of Meat Science and Technology* 3(1): 1990: 44-46

Pigeon muscle protein were fractionated and quantitatively estimated. Significant differences ($P < 0.05$) in sarcoplasmic, myofibrillar, stromal, total and non-protein nitrogens of squabs and adult pigeons were observed. The mean value of sarcoplasmic N was 27.1% in thigh and 20.6% in breast muscles. Myofibrillar N was 14.3% in thigh and 32.3% in breast stromal N of thigh averaged 11.7% whereas that of breast muscles 11.3%. A significant difference ($P < 0.05$) in stromal N contents of breast muscles of squabs and adults was noticed. Mean values of non-protein N in thigh and breast muscles were 8.0 and 11.2%. Total extractable N was 71.2%. AS

182

Keshri (RC), Sharma (N) and Kowale (BN). **Lipid fractions of pigeon meat.** *Indian Journal of Meat Science and Technology* 3(1): 1990: 47-53

Thigh and breast meat lipids of squabs and adult pigeons were fractionated. Total lipid, neutral lipid and phospholipids were resp. 32.82, 20.29 and 10.53 mg/g of wet tissue. Neutral lipid constituted 23.88% of monoglycerides, 22.02% of diglycerides and 54.10% of triglycerides. Free and esterified cholesterol were resp. 1.16 and 0.44 mg/g of wet tissue. Fractions of phospholipids contained (mg/g of wet tissue) phosphatidylcholine (3.62), phosphatidyl ethanolamine (2.39), phosphatidyl serine (1.25), lysophosphatidyl ethanolamine + sphingomyelin, (0.77), phosphatidyl inositol + origin (0.58), lysophosphatidyl choline (0.67) and phosphatidic acid + polyglycerol phosphatide (1.13). Free fatty acids had an av. value of 0.47 mg/g. The squabs had higher total lipids than in adult pigeons. Thigh and breast muscle were not significantly different. Neutral lipid contents were higher in squabs than in adults and also in thigh than in breast. Triglyceride was the major fraction of neutral lipid. Total cholesterol was similar in squabs and adults, whereas total phospholipid varied due to age of muscles. AS

Turkeys

183

King (AJ) and Bosch (N). **Effect of NaCl and KCl on rancidity of dark turkey meat heated by microwave.** *Journal of Food Science* 55(6): 1990: 1549-1551

Patties from six different formulations containing ground dark turkey meat, water, NaCl, and/or KCl were cooked in a microwave oven and stored (4 C) for 9 - 13 days with multiple reheating of the same patties. Thiobarbituric acid analyses revealed that multiple reheating retarded lipid oxidation, including that caused by NaCl (2.0%) which was a pro-oxidant compared to KCl (2.0%). Sensory panelists rated formulations containing greater than or equal to 1.0% KCl more rancid than any others except that containing no added salts. Panelists found no statistical differences in rancidity of patties related to number of times reheated. AS

White leghorn

184

Gowrishankar (TM), Alfred Jaya Prasad (I), Kadirvel (R), Thyagarajan (D) and Ramamurthy (N). **Influence of phase feeding on egg quality traits in White Leghorn pullets.** *Indian Journal of Animal Research* 25(1): 1991: 5-9

The effect of different dietary treatments during phase of laying cycle on the egg traits in Forsgate and Meyer strains were studied. Two groups received 18 and 15% protein level during the 40 wk period from 21 to 60 wk age, and the other groups received phase-fed ration having dietary protein level of 18, 16, 14 or 12% during the age between 21 and 32, 33 and 40, 41 and 52, 53 and 60 wk resp. Reducing the protein levels from 18 to 16, 14 to 12% during different phases of laying cycle did not influence egg wt. in Forsgate strain, but reduced egg wt. in Meyer strain. Continuous feeding of either 18 or 15% protein did not influence albumin index, Haugh unit, yolk index and shell thickness. Reduction in protein level from 13 to 16 or 14 to 12% during phases of laying cycle increased albumin index, Haugh unit and yolk index, but did not influence shell thickness. SRA

Poultry

Products

185

Sekhon (KS) and Bawa (AS). **Effect of frozen storage and extenders on the quality of meat tikkas from culled hens and broiler breeder males.** *Journal of Food Science and Technology (India)* 28(5): 1991: 296-300

Meat tikkas (sausages) from spent hens and broiler breeder males in combination with refined wheat flour (*maida*) semolina and potato as binders were frozen stored (-18 C) as raw or pre-cooked and

evaluated at monthly intervals for proximate comp. and sensory quality. The cooking loss and shrinkage were significantly affected by binders, storage and meat type; while proximate comp. and sensory parameters were significantly affected by cooking as well in addition to these treatments. Among the binders, potato containing samples were preferred the least. Cooking improved sensory quality of tikkas. The tikkas could be stored under frozen conditions for 4 months in case of raw and more than 5 months in case of pre-cooked samples without marked perceivable deterioration in quality. AS

Eggs

186

Satyanarayana Reddy (L), Sreenivas Reddy (M) and Siddiqui (SM). **A study on certain functional properties of chicken and duck eggs.** *Journal of Food Science and Technology (India)* 28(5); 1991; 293-295

Foam vol. and angel cake vol. were high and foam drainage and albumen spread were less in chicken eggs compared to duck eggs. Oils coated refrigerated eggs recorded better functional properties in terms of foam vol., foam drainage, angel cake vol., poaching quality and sensory quality of angel cake compared to oil coated room temp. stored eggs and untreated refrigerated eggs. Flavour and tenderness scores of the angel cakes prepared from chicken egg whites were superior to those prepared from duck egg whites. There was a decrease in functional properties of chicken and duck eggs, as well as sensory qualities of angel cakes prepared from the whites of eggs of both species as storage period increased. AS

187

MarGoshes (BA). **Correlation of protein sulfhydryls with the strength of heat-formed egg white gels.** *Journal of Food Science* 55(6); 1990; 1753, 1756

A strong, direct correlation ($r = 0.97$) was found between egg white protein surface sulfhydryl group (-SH) concn. and the gel strength of its heat-induced gels. An inverse correlation ($r = -0.86$) was also found between the -SH group concn. of 0.1% SDS-denatured egg white proteins and gel strength. Data indicated that surface -SH groups played an important role in strong heat-induced gel formation in egg whites. AS

188

Pandey (NK). **Egg-based foods ensure nutritional adequacy.** *Indian Farming* 40(7); 1990; 44-57

189

Paredi (ME), Mattio (NDVD) and Crupkin (M). **Biochemical properties of actomyosin of cold stored striated adductor muscles of *Aulacomya ater ater* (Molina).** *Journal of Food Science* 55(6); 1990; 1567-1570

Expressible juice showed highest increase within the second day of storage. Actomyosin was partially purified from stored muscles. Both reduced viscosity and Mg^{2+} -ATPase activity of actomyosin decreased about 44% in the first day. These changes were due neither to actomyosin dissociation nor fragmentation of major proteins of the complex. Relative percentage of myosin decreased, and actin increased in actmyosin after the second day. These changes are related to a decrease in the myosin heavy chain and could explain the slow decrease in reduced viscosity and Mg^{2+} -ATPase of this protein after the second day. AS

Fish

Catfish

190

Abide (GP), Hearnberger (JO) and Silva (JL). **Initial fish state and mixing time effects on textural characteristics of a restructured catfish product.** *Journal of Food Science* 55(6); 1990; 1747-1748

A restructured catfish product similar to a corn dog was developed using tumbled catfish from low cost fillets. The product when made from fresh fillets, was more tender but had tougher skin than when made from frozen fillets. Mixing more than 5 min resulted in a more rubbery and tougher product as demonstrated by higher Instron peak load and longer relaxation time. AS

Cod

191

Curran (DM), Tepper (BJ) and Montville (TJ). **Use of bicarbonates for microbial control and improved water-binding capacity in cod fillets.** *Journal of Food Science* 55(6); 1990; 1564-1566

Dipping cod fillets in ammonium and sodium bicarbonate solutions markedly reduced microbial growth compared to untreated samples after 8 days at 4 C. Total plate counts, proteolytic bacteria and

H₂S-producing bacteria were inhibited. Mixing ammonium- and sodium bicarbonates at selected ratios maintained the preservative effect while reducing the ammonia odour. The treated fish had improved texture and moisture retention by both objective and subjective testing but had significantly lower aroma and overall acceptability scores from sensory evaluation. AS

Cubiceps natalensis

192

Lekshmy Nair (A), Stephen (J) and Gopakumar (K). **Nutritive value of edible meat fish-meal from *Cubiceps natalensis*.** *Indian Journal of Animal Science* 60(2); 1990; 251-254

38.8% (av.) of fish consisted of edible portions with 20.6% protein. Protein efficiency ratio values for raw muscle powder and fish-meal were 3.4 and 3.2 resp. compared to 3.0 for casein. The edible meat had a well-balanced amino acid profile. Isoleucine and valine were limiting amino acids of the meal, the chem. score being 88. BV

Finfish

193

Krzynowek (J), Murphy (J), Pariser (ER) and Clifton (AB). **Six Northwest Atlantic finfish species as a potential fish oil source.** *Journal of Food Science* 55(6); 1990; 1743-1744

Menhaden

194

Lin (CF), Hsieh (TC-Y), Crowther (JB) and Bombo (AP). **Efficiency of removing volatiles from menhaden oils by refining, bleaching and deodorization.** *Journal of Food Science* 55(6); 1990; 1669-1672

Alkali-refining and clay-bleaching removed many odorous short-chain oxygenated compounds and alkylbenzenes; steaming deodourization (200 - 208 C, 3 h) eliminated most volatiles from Atlantic and Gulf of Mexico menhaden (*Brevoortia* spp.) oil. Some volatiles in deodourized samples were attributed to container material and antioxidants. BV

Rainbow trout

195

Skrede (G), Storebakken (T) and Naes (T). **Colour evaluation in raw, baked and smoked flesh of**

rainbow trout (*Oncorhynchus mykiss*) fed astaxanthin or canthaxanthin. *Journal of Food Science* 55(6); 1990; 1574-1578

Colour of rainbow trout (*Oncorhynchus mykiss*) was investigated using sensory and instrumental analysis. When judged in pairs with equal carotenoid concn., astaxanthin caused less whiteness, higher chromaticity and more red hue of trout flesh than canthaxanthin. Sensory assessed whiteness, chromaticity and red hue significantly correlated with instrumental values for lightness, chromaticity and hue [CIE (1976) L*a*b* and H(0) ab]. Multivariate regression analysis improved the predicability for all sensory variables compared with univariate analysis. Prediction of carotenoid concn. from instrumental values was better for astaxanthin than for canthaxanthin. AS

Red hake

196

Dymsha (HA), Lee (CM), Saibu (LO), Haun (J), Silerman (GJ), Josephson (ES). **Gamma-irradiation effects on shelf-life and gel forming properties of washed red hake (*Urophycis chuss*) fish mince.** *Journal of Food Science* 55(6); 1990; 1745-1746

Fresh washed red hake (*Urophycis chuss*) mince without cryoprotectants was irradiated at 0 (control), 0.66 and 1.31 kGy and stored aerobically at 3.3 C. The total aerobic plate counts of the control and the low and high levels irradiated samples remained less than 10⁶ CFU/g for 4, 10 and 17 days, resp. Gel strength decreased after irradiation of mince, and such decreases were dose-dependent. Irradiation extended sensory shelf-life of unfrozen fish mince 12-18 days and microbiologically (< 10⁶ CFU/g) 6-13 days longer than the unirradiated control. AS

Sardines

197

Quaglia (GB) and Orban (E). **Influence of enzymatic hydrolysis on structure and emulsifying properties of sardine (*Sardina pilchardus*) protein hydrolysates.** *Journal of Food Science* 55(6); 1990; 1571-1573, 1619

The influence of enzymatic modification with Alcalase was studied on surface hydrophobicity, mol. wt. distribution and emulsifying properties of ten hydrolysates from sardine differing in degree of hydrolysis. Surface hydrophobicity was evaluated fluorometrically using 1 anilino-8-naphthalene sulfonate (ANS); mol. wt. distribution was determined by gel chromatography on a Superfine

Sephadex G50. Emulsifying capacity and stability were evaluated as functions of pH values and product concn., in comparison with sodium caseinate. Results showed emulsifying properties, surface hydrophobicity and the high mol. wt. fraction decreased as degree of hydrolysis increased. Thus production of hydrolysates with desired molecular structures and emulsifying properties is possible. AS

PROTEIN FOODS

Infant foods

198

Singh (MN) and Mathur (BN). **Mineral modification of buffalo milk for infant formula manufacture employing electrodialysis. Part II. Demineralization pattern of nutritionally important ionic species.** *Indian Journal of Dairy Science* 43(1); 1990; 95-98

In view of the physiological significance of differences in the mineral make-up of human milk, and buffalo milk, this study was taken up to investigate the effect of electrodialysis (ED) process on some of the nutritionally important minerals, viz. Ca, P, Na, K, Fe, Cu, Mn and Zn. Concentrated skim milk (28%) TSO and concentrated whey (35%) were subjected to ED process employing brine concn. of 0.6% in depleting stream, feed rate of 90 l/h, voltage potential of 3V and effect of stepwise increase in the ED membrane area on the pattern of diffusion of various minerals was studied. For any given level of demineralization value, and ED membrane surface area, rate of diffusion was found to be different for various electrolytes, being highest for K, followed by Na, Ca, Fe, P in the decreasing order, both in skim milk and whey. At 50% depletion of minerals from skim milk, 92.88% of K, 73.21% of Na, 36.81% of Ca, 29.11% of Fe and 27.25% of P were depleted. Under similar conditions, the % values of depletion from whey were observed to be 68.61, 50.34, 33.49, 32.51 and 26.73 K, Na, Fe and P resp. However, levels of Cu, Mn and Zn were not effected in the ED process, which seems to be a membrane related phenomenon. Significance of varying levels of diffusion rates of different minerals in demineralized skim milk or whey in relation to the nutritional requirements of infants has been projected based upon the results of this investigation. AS

ALCOHOLIC AND NON-ALCOHOLIC BEVERAGES

Alcoholic beverages

Wines

199

Belleville (M-P), Brillouet (J-M), Fuente (TDL) and Moutounet (M). **Polysaccharide effects on cross-flow microfiltration of two red wines with a microporous alumina membrane.** *Journal of Food Science* 55(6); 1990; 1598-1602

200

Romero (LI), Sales (D) and Ossa (EM). **Comparison of three practical processes for purifying wine distillery wastewaters.** *Process Biochemistry* 25(3); 1990; 93-96

Wine alcohol distilleries produce 8 volumes of high strength waste (vinasses) from every volume of ethanol. This waste has an acidic character and a high organic content (20 - 25 g l⁻¹ COD). This paper examines three microbiological treatments (aerobic, mesophilic anaerobic and thermophilic anaerobic) for the reduction of vinasses strength. The processes were studied to optimise operating conditions of each process in order to achieve an adequate purifying performance. Once optimum operating conditions had been attained, biodegradable COD removals around 90% were achieved in all cases, but optimum HRTs were eight days for aerobic, six for mesophilic anaerobic, and four for thermophilic anaerobic processes. A schematic flow-diagram for the complete purifying of vinasses using the three processes is given. AS

Non-alcoholic beverages

Fruit juices

201

Eisele (TA) and Heuser (JR). **A rapid method for separation and quantitation of D-malic acid in fruit juice.** *Journal of Food Science* 55(6); 1990; 1614-1616

A simplified, rapid HPLC chiral LC method was used to resolve D-malic acid in apple, pear, and Concord grape juices. D-malic acid was detected and quantitated at 330 nm in < 15 min/sample. The detection limit appeared to be 2 mg/100 mL D-malic acid in 12 Brix juice, or 0.33% total malic acid in a typical apple juice containing 0.6 g/100 mL using this method. BV

Apple juices

202

Amar (RB), Gupta (BB) and Jaffrin (MY). **Apple juice clarification using mineral membranes: Fouling control by backwashing and pulsating flow.** *Journal of Food Science* 55(6); 1990; 1620-1625

New mineral membranes of ceramic (Ceraflo) and carbon (Carbone Lorraine), were used for apple juice clarification using cross flow microfiltration. Effect on performance of the parameters transmembrane pressure, inlet flow velocity, membrane nature, and temp. were studied. Optimum permeate flux was at a transmembrane pressure of about 3.5 bar for both membranes. Formation of a concn. layer of rejected particles was reduced by using techniques backwashing and pulsating inlet flow. These techniques provided a major flux restoration and steady permeate flux increased by 30 - 50% with backwash and up to 100% with pulsating inlet flow. AS

Grape juices

203

Lin (TY) and Vine (RP). **Identification and reduction of ellagic acid in muscadine grape juice.** *Journal of Food Science* 55(6); 1990; 1607-1609, 1613

The precipitate which forms during storage of clarified and pasteurized Magnolia and Carlos muscadine juices was examined using paper chromatography, HPLC, and ultraviolet, infrared and mass spectrometries. The methanol washed juice precipitate was identified as ellagic acid. The concn. of ellagic acid in Magnolia juice treated with polyvinylpyrrolidone (PVPP) at 0.12, 0.36, 0.60, 0.84 and 1.08 g/L and gelatin at 0.06, 0.12 and 0.24 g/L were determined. The treatment using 1.08 g PVPP/L was most effective in reducing ellagic acid, total phenolics, and juice browning. AS

Guava juices

204

Hodgson (AS), Chan (HTJr), Cavaletto (CG) and Perera (CO). **Physical-chemical characteristics of partially clarified guava juice and concentrate.** *Journal of Food Science* 55(6); 1990; 1757-1758, 1761

Pear juices

205

Hsu (J-C), Heatherbell (DA) and Yorgey (BM). **Effects of variety, maturity and processing on pear juice quality and protein stability.** *Journal of Food Science* 55(6); 1990; 1610-1613

Hard green and soft ripened d'Anjou, Comice and Bartlett pears were processed (with or without SO₂) into clarified juices. Browning increased with heat treatment and was reduced by SO₂ in processing. Total soluble protein content increased with fruit maturity and processing with SO₂. Protein fractions from a clarifying enzyme preparation (mainly arabinase and amylase) with mol. wt. in the range of 64,000 - 92,000 and containing glycoproteins were not removed by fining/clarification contributing to protein instability in clarified pear juices, but could be removed by pasteurization prior to final filtration and bottling. Enzymes added for clarification during processing may contribute to post-clarification haze and sediment formation. BV

FATS AND OILS

206

Welsh (FW), Williams (RE) and Dawson (KH). **Lipase mediated synthesis of low molecular weight flavour esters.** *Journal of Food Science* 55(6); 1990; 1679-1682

Screening 27 commercial lipases showed that enzymes from *Candida cylindracea*, *Pseudomonas fluorescens* and *Mucor miehei* (immobilized) promoted synthesis of selected low mol. wt. esters in nonaqueous systems. Max. production after 24 h incubation was obtained with substrate concn. of 0.05 mol/L for isopentyl acetate, 0.2 mol/L for ethyl butyrate and 0.3 mol/L for isopentyl butyrate. Yield of butyl butyrate was almost 100% at acid substrate greater than 0.2 mol/L. Substrate inhibition was observed with *P. fluorescens* lipase but not with *C. cylindracea* or *M. miehei* lipases, up to 1 mol/L. Hexane, octane and decane could be used as reaction media except for ethyl butyrate synthesis where hexane was the medium of choice. Poor synthesis was achieved when methylene chloride was used. AS

Oils

207

Gupta (HC), Verma (JP), Bareth (SS) and Mathur (BN). **Evaluation of some non-edible oils as grain protectant in wheat and their subsequent effect on germination.** *Indian Journal of Entomology* 50(2); 1988; 147-150

Efficacy of different non-edible oils viz. *neem* (*Azadirachta indica* A. Juss), *karanj* (*Pongamia glabra* Vent), *mahua* (*Bassia latifolia* Roxb.), *pillu* (*Salvadora persica* Linn.) and *undi* (*Calophyllum inophyllum* Linn.), *palas* (*Butea frondosa* Konig) and *dhupa* (*Vateria indica* Linn.), at 2.5 ml and 5 ml/kg of wheat seeds was worked out for protecting the grain from pest infestation in storage with their effect on germination. All the treatments were found significantly better over control but the treatment at 2.5 ml/kg seed was found less effective in comparison to 5 ml/kg seed. *Neem* and *palas* at 5 ml/kg seed offered better protection by allowing only 0.2 and 1.2% infestation after 6 months and 1.3 and 3.3% infestation after 12 months of the treatment, resp. Further, germination was also not impaired by effective treatments. AS

Coconut oils

208

Palaniswami (A), Valliappan (T) and Neelakantan (S). **Effect of fungal contamination of copra on the quality of coconut oil.** *Indian Coconut Journal* 19(11); 1989; 10-13

This study reports that the incidence of fungi on copra ranged from 1.5 to 2%. *Rhizopus nigricans*, *Aspergillus niger*, *Aspergillus flavus*, *Penicillium* sp. were the storage fungi recorded on copra besides *Botryodiplodia theobromae*. In oil extracted from contaminated copra the melting and smoke points were lower compared to check samples. There was slight reduction of these values when oil was stored for 2 months. The onset of rancidity was quicker in oil samples contaminated with *R. nigricans* and *B. theobromae* compared to oil contaminated with *Asp. flavus* and check samples. Iodine saponification, free fatty acids and peroxide values showed an increase in contaminated oils than in check. This was pronounced over the period of storage. Aflatoxin in oil extracted from copra contaminated with *A. flavus* was 19 mg/kg and only trace quantity were present in those contaminated with *R. nigricans* and *B. theobromae*. SRA

SPICES AND CONDIMENTES

209

Fleisher (A). **The protoplast extraction technique in the flavour and fragrance industry.** *Perfumer and Flavourist* 15(5); 1990; 27-36

The present technique reported here is based on liquid-liquid chromatography modified for industrial use and provides a convenient and cost-effective way to prepare natural aroma ingredients. Its application facilitates exhaustive recovery and/or

separation with min. equilibrium and settling time, minimization of amounts of solvents required for efficient extraction, utilization of universal and simple equipment suitable for recovery and/or separation of a large var. of raw materials. BV

Essential oils

210

Lawrence (BM). **Progress in essential oils.** *Perfumer and Flavourist* 15(5); 1990; 57-60, 63-65

Covers celery oil, spike lavender oil, thyme oil, lovage oil and basil oil. BV

211

Shaw (PE), Carter (RD), Moshonas (MG) and Sadler (G). **Controlled atmosphere storage of oranges to enhance aqueous essence and essence oil.** *Journal of Food Science* 55(6); 1990; 1617-1619

Aqueous essences from treated (24 h under anaerobic conditions at room temp. with N₂ and < 1% O₂) freshly harvested Valencia and pineapple oranges showed increased acetaldehyde, ethanol and several other alcohols, aldehydes and esters, and essence oils from treated fruit showed increased methanol, ethanol, ethyl acetate and ethyl butyrate. Flavour panels determined significant differences in essences and essence oils from treated vs control Valencia but found no differences in treated vs control pineapple oranges. BV

212

Lawrence (BM). **Progress in essential oils.** *Perfumer and Flavourist* 16(2); 1991; 59-67

Covers rosemary oil, lime oil, balsam fir oil, Siberian fir needle oil, and Pinus sylvestris oil. BV

213

Lawrence (BM). **Progress in essential oils.** *Perfumer and Flavourist* 16(1); 1991; 49-58

Covers coriander oil, cardamom oil, dill weed oil and mandarin oil. BV

214

Nigam (MC) and Ahmed (A). **The essential oil of Cinnamomum tamala II.** *The Pafal Journal* 12(3); 1990; 24-25

The earlier communication on oil of *Cinnamomum tamala* by the author describes, 24 of the lower boiling terpenoid in the oil amongst which linalool present to an extent of 19.7% was predominating. A

perusal of the higher boiling constituents coming in the gas chromatogram at higher retention times reveal the presence of the following constituents: Trans-carveol 0.0005%, citronellyl acetate 0.74%, cinnamic aldehyde 52.86%, isoeugenol 4.90%, isoeugenyl methyl ether 1.629% and farnesol 0.693%. AS

Citrus oils

215

Boelens (MH). **A critical review on the chemical composition of citrus oils.** *Perfumer and Flavourist* 16(2); 1991; 17-34

This review covers chem. comp. of sweet orange oils (monoterpenoids and aliphatic compounds) bitter orange oils (monoterpenoids and aliphatic compounds), lemon oils, mandarin and tangerine oils, grapefruit oils and lime oils. BV

Spices

216

Ismail (A) and Pierson (MD). **Inhibition of growth and germination of *C. botulinum* 33A, 40B and 1623E by essential oil of spices.** *Journal of Food Science* 55(6); 1990; 1676-1678

Essential oil of spices (clove, thyme, black pepper, pimenta, origanum, garlic, onion and cinnamon) at 200 p.p.m. inhibited significantly growth of *Clostridium botulinum* type 33A, 40B and 1623E. The order of effectiveness of essential oil of spices is: cinnamon, origanum and clove > pimenta and thyme > garlic, onion and black pepper. At 10 p.p.m. garlic and onion showed higher activity than the others. Spores of 33A were more sensitive than 40B and 1623E. BV

217

Gopalakrishnan (N) and Narayanan (CS). **Extraction of spices with carbon dioxide.** *The Pafal Journal* 12(4); 1990; 21-24

This report briefly covers the studies carried out on the extraction of commonly known Indian spices (pepper, ginger, clove, cardamom, chilli, nutmeg and minor spices) using liquid carbon dioxide (i.e. at a pressure above 73 bars and temp. below 31.3 C) and also with supercritical carbon dioxide (i.e. at pressure above 73 bars and temp. above 31.3 C). BV

218

Raghavan (B), Abraham (KO) and Shankaranarayana (ML). **Encapsulation of spice and other flavour materials.** *Indian Perfumer* 34(1); 1990; 75-85

The exp. details regarding the preparation/manufacture of encapsulated spice oils, oleoresins and citrus oils are described. The product obtained is a fine free-flowing powder with a shelf-life of over 2 yrs. In the molten extrusion method the flavour material is blended with the molten carbohydrate matrix and extruded into a cold solvent. The study includes the storage behaviour of the encapsulated products and analytical data on the volatile and non-volatile constituents. The paper also discusses the application of the encapsulated spice and citrus flavours in different foods/beverages. BV

Foeniculum vulgare

219

Gurdip Singh, Upadhyay (R), Narayanan (CS) and Padmakumari (KP). **Chemical investigation of the essential oil of *Foeniculum vulgare* Mill.** *Indian Perfumer* 34(4); 1990; 247-249

GC/MS studies on essential oil from seeds of *Foeniculum vulgare* Mill. have revealed the presence of 20 components, out of which 13 comprising 96.04% of the total oil, have been identified. AS

Ginger

220

Giridharan (MP) and Balakrishnan (S). **Effect of gamma-irradiation on yield and quality of ginger.** *Indian Cocoa, Arecanut & Spices Journal* 14(3); 1991; 100-103

Ginger rhizomes of var. Rio-de-Janeiro and Maran were irradiated with ⁶⁰CO gamma rays at 0.7, 1.5 and 2 Krads before planting. Gamma-irradiation did not significantly affect the essential oil and oleoresin contents of ginger and ginger peel. However higher oleoresin content was observed at 1 Krad compared to the other levels. Oleoresin content in the ginger peel was max. at 1 and 1.5 Krad in Rio-de-Janerio and 2 Krad in Maran. GS

221

Mishra (D). **Seed protectant property of essential oil of *Zingiber officinale* Roscoe.** *Indian Journal of Entomology* 34(4); 1990; 266-268

The antifungal activity of the volatile oil obtained from the rhizomes *Z. officinale* against the test fungus *Fusarium moniliforme* (NRRL 6398) remained

unaffected by fluctuations in temp., pH, and storage. The protein and starch contents of the mung seeds dressed with the oil and inoculated with the test fungus were not much affected while these nutritional components were much reduced in seeds infested with the test fungus. AS

Moringa oleifera

222

Dayrit (FM), Alcantar (AD) and Villasenor (IM). **Studies of *Moringa oleifera* seeds. Part I. The antibiotic compound and its deactivation in aqueous solution.** *Phillippine Journal of Food Science Technology* 119(1); 1990; 23-32

4-[α -rhamnosyloxy]benzyl isothiocyanate, A, and 4-[α -L-rhamnosyloxy]phenylacetonitrile, B, were isolated from the raw seeds of *Moringa oleifera* by hot water extraction. A was found to be active against *Bacillus subtilis* but inactive against *Escherichia coli*. B was inactive against both organisms. When left to stand in an aqueous methanol solution, A decomposes and loses its antibacterial activity. AS

223

Villasenor (IM), Dayrit (FM) and Lim-Sylianco (CY). **Studies on *Moringa oleifera* seeds. Part II. Thermal degradation of roasted seeds.** *Phillippine Journal of Food Science Technology* 119(1); 1990; 33-39

The thermal degradation products of roasted seeds of *Moringa oleifera*, Lam., were compared to the non-roasted seeds. HPLC analysis showed that 4(α -L-rhamnosyloxy)phenylacetonitrile is a thermal degradation product. It is produced from the parent 4(α -L-rhamnosyloxy)benzyl glucosinolate during roasting. It is not produced from the pyrolysis of 4(α -L-rhamnosyloxy)benzyl isothiocyanate. AS

SENSORY EVALUATION

224

Ramakrishna (P). **A generalised chart for sensitivity and breakeven analysis.** *Indian Food Industry* 9(4); 1990; 24-27

Simple chart that could be used for both sensitivity and also breakeven analysis is presented. SRA

FOOD STORAGE

225

Price (NR), Hoppe (T) and Watson (H). **Methacrifos as a grain protectant. A comparison of the vapour effects of some organophosphorus insecticides used in grain protection.** *Pesticide Science* 31(1); 1991; 1-7

A simple radiochemical method was devised for the estimation at ambient temp. of vapour uptake and toxicity of relatively non-volatile organophosphorus insecticides to the red flour beetle *Tribolium castaneum*. Over a three-day period the insecticides pirimiphos-methyl and chlorpyrifos-methyl exhibited no vapour activity and only small amounts of vapour were accumulated by test insects. Methacrifos appeared to be much more active as a vapour and much of its toxic action in an ideal situation could be attributed to this phenomenon. AS

226

Kachru (RP) and Bisht (BS). **Integrated agro storage-cum-processing complex.** *Productivity* 31(2); 1990; 232-238

This paper stresses the importance laid down in recent yrs on modernization of foodgrain trade for better efficiency in marketing and to ensure remunerative prices to the growers. The model suggested here conceives the vertical integration of the food distribution/processing chain through storage-cum-processing complex. The paper also deals with detn. of viability of such a model for a tropical Indian village vis-a-vis the risk factors associated with its functioning. BV

INFESTATION CONTROL AND PESTICIDES

227

Dutt (N). **Bioecological studies on F_1 immature forms obtained from crosses of *Callosobruchus chinensis* L. exposed to sublethal concentrations of organophosphorus insecticides.** *Indian Journal of Entomology* 50(3); 1988; 307-314

Bioecological behaviour of F_1 immature forms obtained from crosses of parents exposed to 3 sublethal conc. at the levels of LC 40, LC 30 and LC 20 of each of diazinon, fenitrothion, fenthion, dimethoate and methyl demeton, was investigated. Reduction in incubation period of egg, larval and pupal periods were observed. F_1 eggs were smaller in size, both in length and width and their viability was lower in comparison to control. The period of reduction of different immature forms varied with variation of insecticides. With gradual decrease in the level of sublethal conc. the period of reduction also decreased. Shortening of life period of different immature forms in the life cycle of F_1 generation

from parent exposed to sublethal conc. of insecticides thus contributes towards quick population build up and subsequent pest resurgence. AS

228

Saxena (VS). **Significance of α -hexachlorocyclohexane in DDT potentiation against DDT resistant *Tribolium castaneum* Herbst.** *Indian Journal of Entomology* 50(3); 1988; 315-318

Bioefficacy of DDT and pyrethrum in combination of α -BHC, PBO and safrole was compared against normal and DDT resistant *T. castaneum*. Combinations pyrethrum + α -BHC (L 50:0.45567) and DDT + α -BHC (Lc 50:0.52004) enhanced max. the susceptibility of DDT-resistant *T. castaneum* i.e. 2.2 and 9.2 times resp. as compared to other combinations. Potentiation of DDT and pyrethrum, having different mode of action, by α -BHC on DDT resistant *T. castaneum* suggested relatively high affinity of α -BHC than PBO and safrole to detoxifying enzymes. AS

229

Watanabe (S), Igarashi (Y), Yagami (K) and Imai (R). **Antimicrobial activity of some N-(Fluorophenyl)maleimides.** *Pesticide Science* 31(1); 1991; 45-51

N-(Monofluorophenyl)maleimides exhibited antibacterial activity against *Bacillus subtilis*, *Staphylococcus aureus* and *Escherichia coli*, and no activity against *Pseudomonas aeruginosa*. These compounds also showed antifungal activity against *Aspergillus niger*, *Penicillium citrinum*, *Cladosporium cladosporioides* and *Aureobasidium pullulans*. All N-(fluorophenyl)maleimides tested showed activity against yeasts. BV

230

David (BV). **Emerging technologies in insect pest control.** *Pestology* 14(6); 1990; 7-10

Covers world pesticide scene, emerging technologies and techniques (new molecules development and concepts, new formulation technologies, biotechnology (biopesticides, pheromones and genetic engineering) and plant derived insecticides), new technique to establish pests resistance to insecticides and application technology. BV

231

Williams (JO). **Influence of temperature and humidity on the biology of insecticide-resistant**

and susceptible strains of *Tribolium castaneum* (Herbst.) (Coleoptera: Tenebrionidae). *Insect Science and Its Application* 10(5); 1989; 607-615

The influence of temp. and humidity on the biology of insecticide-resistant and susceptible strains of *Tribolium castaneum* (Herbst) was studied and compared. At all temp. (20, 25, 30 and 40 C) and rh (30, 50, 70, 90) tested, the insecticide-resistant strain matured earlier than the susceptible strain. For both strains, the lowest and highest temp. limits for embryonic development and egg hatching were 20 and 40 C, resp. The incubation period for eggs of both strains averaged 14 days at 20 C and 4 days at 30 C. Females of the insecticide-resistant strain matured for egg laying earlier (24 h) than the susceptible strain (60 h) but laid fewer eggs (36 eggs) than the latter strain (238 eggs). At 30 C and 70% rh the resistant strain had a shorter developmental period (15 days) than the susceptible strain (21 days). Temp. influenced the development of larvae of both strains of *T. castaneum*. Larvae of the susceptible strain did not develop at 20 C and 30% rh, 20 C and 90% rh and 40 C and 30% rh, whereas larvae of the resistant strains did. The pupae of both strains developed at all the temp. and relative humidity regimens tested. Temp. and humidity of stored food would therefore, act together to influence the abundance of strains of *T. castaneum* and the two factors could be manipulated to suppress the population growth of this beetle on stored food. AS

232

Dabi (RK), Puri (MK), Gupta (HC) and Sharma (SK). **Synergistic response of low rate of *Bacillus thuringiensis* Berliner with sub-lethal dose of insecticides against *Heliothis armigera* Hubner.** *Indian Journal of Entomology* 50(1); 1988; 28-31

A lab. experiment was conducted to determine the possibility of low rate of Dipel (8,000 IU) alone and in combination with sub-lethal doses of insecticides viz., carbaryl (0.05%), endosulfan (0.02%), malathion (0.02%), monocrotophos (0.02%) and phenoate (0.02%) against fifth instar larvae of *Heliothis armigera* Hubner on gram (*Cicer arietinum* L.). Both insecticidal and Dipel sprays alone gave less than 50% kill at 72 h after treatment. The combination of Dipel and insecticides viz., carbaryl, endosulfan, malathion and monocrotophos gave synergistic response. A mixture of Dipel + endosulfan and Dipel + monocrotophos both at (8,000 + 0.02%) proved best and gave 100% kill within 48 h after treatment. AS

233

Kaul (CK), Mehrotra (P) and Singh (SD). **Chemical control of gram podborer.** *Indian Journal of Entomology* 50(4); 1988; 532-533

234

Singh (R) and Kavadia (VS). **Effect of environmental factors on the residual toxicity and persistence of insecticides. III. Effect of temperature and humidity on the residual toxicity of insecticides.** *Indian Journal of Entomology* 51(4); 1989; 450-457

The films of carbaryl, endosulfan and malathion were prepared on the glass and bean leaf (*Dolichos lablab* Roxb. and L.). The residual toxicity was determined by bioassay with adults of *Tribolium castaneum* Herbst. The treated glass and leaf surfaces were subjected to the combination of three temp. levels of 25, 35 and 45 C with two humidity levels of 60 plus or minus 5% and 80 plus or minus 5% R.H. It was observed that high temp. (45 C) coupled with low humidity (60 plus or minus 5% R.H.) had more deleterious effect on the residual toxicity of insecticides. The two humidities to which the insecticidal films were exposed at different temp. seemed to have no effect on the two different dosages of same insecticides, but have their effect when combined with different temp. Almost the same trend of loss in the residual toxicity was observed on both glass and leaf surfaces. The max. residual toxicity was seen in the case of carbaryl which was followed by endosulfan and malathion. AS

225

Chakravorty (S), Deb (DC) and Samui (TN). **Feasibility of hormonal control of some insect pests: A laboratory-based conclusion.** *Indian Journal of Entomology* 51(2); 1989; 139-149

Effects of juvenoids (hydroprene and methoprene) and antiallatotropin (precocene II) on the moulting, metamorphosis and development have been evaluated upon three lepidopteran pests - *Corcyra cephalonica*, *Anomis sabulifera* and *Utethesia pulchella*. Juvenoid-induced inhibitory effect on these processes, and production of intermediates (upto 100%) are highly suggestive for considering the tested compounds as tools for pest control. Hydroprene inhibits or disturbs the metamorphosis and /or growth and differentiation of larval labial gland, gut and gonads of *C. cephalonica*. Pupal web spinning is largely inhibited and production of normal ripe eggs and viable sperms is also affected. Methoprene also prevents the larvae from spinning the pupal web, leading ultimately to their death. Precocene II induces sterility effect in both the sexes of this species. In the light of these observations the prospect of juvenoid and antiallatotropin for controlling the insect pests has been discussed. AS

236

Prabha (PGS) and Sehgal (SS). **Population stress as a regulating factor for the abundance of *Callosobruchus analis* (Fabricius).** *Indian Journal of Entomology* 51(2); 1989; 150-153

Using *Callosobruchus analis* (Fab.), pest of leguminous seeds, the effect of population density was observed on some aspects of the reproduction and growth of its progeny. The overcrowding of the parents reduced the fecundity and adult emergence but increased the development period. AS

237

Singh (R) and Kavadia (VS). **Effect of environmental factors on the residual toxicity and persistence of insecticides. II. Effect of sunlight on residual toxicity and persistence of insecticides.** *Indian Journal of Entomology* 51(3); 1989; 300-314

The residual toxicity and persistence of insecticides are dependent on the multitude of environmental factors. The investigation on the effect of sunlight have been carried out on the fate and behaviour of carbaryl, endosulfan and malathion. The film with approximate LD 50 and its 2 to 2.5 times higher dosages of each of the insecticides were prepared on glass plate and bean leaf (*Dolichos lablab* Roxb. and L.). The residual toxicity was determined by bioassay with adults of *Tribolium castaneum* Herbst. Estimation of microquantities of insecticides was done by employing microbioassay and spectrophotometric assay. The treated glass and leaf surfaces were subjected to natural sunlight and to deduce the effect of direct sunlight some samples were kept side by side in shade at same environmental condition. It was observed that the deterioration in the toxicity of all the three insecticides was quicker when treated surfaces were exposed to sunlight than kept in the shade. The dissipation of insecticides was faster when the treated surfaces were subjected to 8 h sunlight and 16 h shade per day than when subjected to continuous 24 h shade condition. AS

BIOCHEMISTRY AND NUTRITION

238

Maya Gowri (S), Saradha (V) and Parvathi Eswaran (P). **Effect of high fibre diet on blood lipid profile on selected rural and urban adult population.** *Indian Journal of Nutrition and Dietetics* 27(5); 1990; 131-143

The diets of urban and rural male adults were supplemented with pulses, vegetables and fruits for a period of 30 days to provide 16 g of crude fibre. A preliminary survey of the urban and rural high

income and low income groups was conducted for the prevalence of hypercholesterolemia, hypertension, diabetes mellitus, renal calculi obesity and gall stones. The types of food consumed was also assessed. The urban and rural high income groups consumed 8.0 g of fibre in their diet whereas it was 4.8 plus or minus 0.6 g and 6.3 plus or minus 0.5 g for middle income group of rural and urban areas resp. In low income group the fibre consumption was only 3.4 g. All the subjects had normal cholesterol level irrespective of the fibre intake, but it was higher in the higher income group. The serum triglycerides content decreased with decrease in income levels. Supplementation of fibre diet for 30 days showed a decrease in body wt. of 1 to 2 kg in normal subjects and 3 to 4 kg in obese people. The serum cholesterol level decreased from 1 to 15 mg/100 ml in fibre supplemented group compared to 1 to 2 mg/100 ml increase in control group. No significant change was noted in the high density lipid - cholesterol value after supplementation. The low density lipid-cholesterol level of the experimental group decreased by 1 to 13 mg/100 ml as against an increase of 1 to 3 mg/100 ml in the control. A decrease of 2.5% in the mean serum triglyceride value was observed after supplementation whereas in the control group there was an increase of 3.8%. GS

239

Uma Reddy (M), Padmavathi (P), Shoba (S), Vijayalakshmi (V) and Laxmi Devi (L). **Food and nutrition intake with special reference to fat intake among low income population of Hyderabad and Secunderabad.** *Indian Journal of Nutrition and Dietetics* 27(5); 1990; 153-158

Adult men (355), women (361), adolescents (225), school children (323) and preschool children (202) from among the low income population of Hyderabad and Secunderabad (rural and urban), Andhra Pradesh (India) were studied for the mean food intake (g) per day. Cereal intake was from 441 to 553 g/d and pulses from 30 to 36 g/d. Intake of milk, green leafy vegetables, fruits and oil was low and intake of other vegetables was high. Bread and biscuits were also consumed. However, the diet did not meet the total calorie requirement. Intake of β -carotene, retinol and riboflavin was very low, quality of protein taken was low; intake of B-complex vitamins and ascorbic acid was satisfactory. However, the food and nutrient intake was better among urban (particularly among industrial workers) than among rural population. Visible fat intake ranged from 18 to 19 g/d and invisible fat intake was from 20 to 22 g/d. GS

240

Jha (V), Barat (GK) and Jha (UN). **Nutritional evaluation of *Euryale ferox* Salisb. (Makhana).** *Journal of Food Science and Technology (India)* 28(5); 1991; 326-328

Amino acid comp. of *Euryale ferox* Salisb. (Makhana) was worked out and feeding trials of this crop was carried out on albino rats. The values relating to essential amino acid index (EAAI) and chemical score (CS) of Makhana were close to those of fish. While EAAI and CS of Makhana were superior to those of most plant based diets, its biological value (BV) was found to be lower. The low BV of Makhana was attributed to the higher value of leucine to isoleucine ratio. The often quoted statement that a greater degree of utilization of protein by the experimental animal is predicted from a higher value of arginine plus lysine to proline ratio is found to be not applicable to Makhana. AS

241

Chang (M-C) and Morris (WC). **Effect of heat treatments on chemical analysis of dietary fiber.** *Journal of Food Science* 55(6); 1990; 1647-1650, 1675

Apple fiber, corn fiber and oat bran and soy fiber were processed by autoclaving (121 C/15 min, 100 C/30 min) and microwave heating (5/10 min). Autoclaving reduced insoluble dietary fiber (IDF) of apple and total dietary fiber (TDF) of apple fiber and oat bran. Microwave heating reduced TDF in apple fiber and oat bran and IDF in oat bran but increased the soluble dietary fiber (SDF) of apple fiber. All treatments decreased the SDF in corn fiber. BV

242

Zhang (WB) and Addis (PB). **Prediction of levels of cholesterol oxides in heated tallow by dielectric measurement.** *Journal of Food Science* 55(6); 1990; 1673-1675

Two quality control procedures currently used for frying oil were evaluated with respect to efficiency of prediction of cholesterol oxidation products (COPS) levels. Tests in a French fried potato model system (90% tallow/10% cottonseed oil) showed the correlation between dielectric measurement and the COPS levels in the frying medium was highly significant ($r = 0.94$, $N = 30$, $P < 0.01$). Free fatty acid "test strips" showed no quantifiable change during 112 h and, therefore there was no correlation with COPS levels. Free fatty acids (AOAC procedure 28.032 [b]) highly correlated with COPS levels ($r = 0.94$, $N = 30$, $P < 0.01$). AS

243

Owusu-Yaw (J), Toth (JP), Wheeler (WB) and Wei (CI). **Mutagenicity and identification of the**

reaction products of aqueous chlorine or chlorine dioxide with L-tryptophan. *Journal of Food Science* 55(6): 1990; 1714-1719, 1724

Nonvolatile products generated from reactions of graded molar ratios of aqueous chlorine or chlorine dioxide with L-tryptophan (1:1, 3:1 and 7:1) were shown to be direct-acting mutagens to *Salmonella typhimurium* TA100 and TA98. Increasing the ratio of disinfectant relative to amino acid led to increased mutagenic activity, with mutagenicity highest at the 7:1 molar ratio. Several fluorescent bands obtained after thin layer chromatographic fractionation of the reaction mixtures were shown to be more mutagenic than the reaction mixtures. GC/MS analysis of the compounds in a highly mutagenic fraction of the aqueous chlorine reaction products identified 1,1,3-trichloropropanone, 1,1,3,3-tetrachloropropanone and dichloroquinoline. AS

244

Gifford (SR) and Clydesdale (FM). **Interactions among calcium, zinc and phytate with three protein sources.** *Journal of Food Science* 55(6): 1990; 1720-1724

Various combinations of Ca (4.94 mmol), Zn (0.0071 mmol) and phytate (0.284 mmol) were added either to soy conc., casein or torula yeast to determine effects of their interaction on *in vitro* solubility of protein, Ca, Zn and phytate (PA). Two Ca sources, CaCO₃ and Calcium-citrate-malate complex (CCM) were used. Two pH levels, 2.0 and 5.5, were used to simulate gastrointestinal pH conditions. An increase in pH significantly reduced ($P < 0.01$) Zn solubility in all treatments with all protein sources. The solubility of Ca and PA were significantly decreased ($P < 0.01$) when both components were present probably due to formation of insoluble Ca-PA complexes. At pH 5.5, with casein and yeast proteins, Zn was significantly more ($P < 0.01$) soluble in samples with CCM, in the absence of PA, than in those with CaCO₃. AS

245

Phillips (LG) and Kinsella (JE). **Effects of succinylation on β -lactoglobulin foaming properties.** *Journal of Food Science* 55(6): 1990; 1735-1739

The extent of succinylation of β -lactoglobulin (β -Lg) increased logarithmically with increasing concn. of succinic anhydride. The surface pressure of 27.5% succinylated β -Lg was higher than native β -Lg but higher levels of succinylation (50% and 100%) reduced the surface pressure. Overrun and foam stability were reduced following succinylation. The electrostatic interaction caused by the addition of

100% succinylated β -lactoglobulin (0.5/100 mL) to a solution (2.5%) of native β -lactoglobulin at pH 4.0 improved overrun (47%) and foam stability (61%). AS

246

Schulz (LO) and Csete (J). **Nutrition concerns in Bangladesh: The focus for improvement.** *Progress in Food and Nutrition Science* 14(2/3): 1990; 259-276

The results of efforts to identify the prevailing nutritional deficiency disorders in Bangladesh and major topics of local scientific investigation influencing those nutrient disorders are reviewed. Primary areas of emphasis include studies addressing nutritional status (especially vitamin A); factors influencing diarrheal incidence, morbidity and mortality; child nutrition; the influence of seasonal variations; and the implementation of successful intervention programs. Programmatic implications of the findings are presented. AS

TOXICOLOGY

247

Beri (HK), Vadehra (DV) and Gupta (JK). **Proportionate incidence of mycotoxic fungi - *Fusarium* and its effect on ingestion by poultry.** *Journal of Food Science and Technology (India)* 28(5): 1991; 329-331

Penicillia, Aspergilli, Mucor and Fusaria are major fungi prevalent in different farms and fish products (dried and semi-dried). *Fusarium* infested rice mixed with standard feed (20:80, w/w) when fed to one wk old chicks for 15 wks, negative wt. change and low feed intake rate were observed. Due to impairment of various enzyme activities of vital organs like liver, heart, spleen and pancreas, the metabolism and respiratory enzymes were affected. AS

248

Bilgrami (KS), Sahay (SS), Shrivastava (AK) and Rahman (MF). **Incidence of zearalenone, DON and T-2 toxin producing strains of *Fusarium* sp. on food items.** *Proceedings of the Indian National Science Academy* 56(2): 1990; 223-228

A total of 160 isolates of *Fusarium* were collected from cereals, vegetables and fruits. These isolates were systematically classified in different strains. Ability of strains to produce mycotoxins was tested on moist-rice medium. Zearalenone was produced by 6.8% of the total strains 15.6% strains produced Deoxynivalenone (DON) while T-2 toxin was

synthesized by 7.5% of the total strains. Toxin concn. ranged from 1.2 to 28.2 µg/g (Zearalenone) 0.3 to 2.9 µg/g (DON) and 5.2 to 20.6 µg/g (T-2 toxin). AS

FOOD LAWS AND REGULATIONS

Nil

AUTHOR INDEX

- | | | |
|------------------------|-------------------|-----------------|
| Abide (GP) | 8 | Blair (GT) |
| 190 | Autio (K) | 113 |
| Abraham (KO) | 146 | Bodyfelt (FW) |
| 218 | Ayranci (E) | 15 |
| Acharya (RC) | 80 | Boelens (MH) |
| 126 | Ayranci (G) | 215 |
| Adams (JB) | 80 | Bombo (AP) |
| 16 | Bachhil (VN) | 194 |
| Addis (PB) | 168 | Bosch (N) |
| 242 | Baer (RJ) | 183 |
| Adsule (PG) | 134 | Bourne (MC) |
| 78 | Bains (GS) | 64 |
| Agrawal (SR) | 79 | Brekke (CJ) |
| 103 | Bajaj (S) | 152 176 177 |
| Aguilera (M) | 118 | Brillouet (J-M) |
| 173 | Bakhshi (AK) | 199 |
| Ahmed (A) | 49 | Buchanan (RL) |
| 214 | Bakr (AA) | 29 |
| Akamittath (JG) | 55 | Buechler (PR) |
| 152 | Balakrishnan (S) | 157 |
| Akrida-Demertzi (K) | 220 | Bufo (SA) |
| 92 | Bandyopadhyay (C) | 87 |
| Al-Malah (K) | 89 | Burfoot (D) |
| 15 | Bangs (WE) | 174 |
| Alcantar (AD) | 10 | Callahan (A) |
| 222 | Barat (GK) | 91 |
| Alfred Jaya Prasad (I) | 240 | Cariddi (C) |
| 184 | Bareth (SS) | 87 |
| Amar (RB) | 207 | Carter (RD) |
| 202 | Bawa (AS) | 211 |
| Anand (SK) | 179 185 | Cassens (RG) |
| 178 | Belleville (M-P) | 172 |
| Ang (CYW) | 199 | Cavaletto (CG) |
| 175 | Beltran (JA) | 204 |
| Angelo (AJSt) | 173 | Cessna (AJ) |
| 156 | Beri (HK) | 41 |
| Anjaneyulu (ASR) | 247 | Chakravorty (S) |
| 170 | Bernard (DT) | 235 |
| Anon. | 28 | Chambers (EIV) |
| 31 36 59 | Bhat (GS) | 74 |
| Antonacci (E) | 119 | Chan (HTJr) |
| 87 | Bhattacharya (KR) | 204 |
| Arntfield (SD) | 26 | Chandna (M) |
| 57 | Bhilegaonkar (KN) | 48 |
| Arora (KL) | 162 | Chang (C-Y) |
| 138 | Bilgrami (KS) | 65 |
| Arteaga (GE) | 248 | Chang (M-C) |
| 22 | Bisht (BS) | 241 |
| Arya (SS) | 226 | Chang (Y-I) |
| 12 | Bist (GS) | 21 |
| Astrom (A) | 168 | Chatterjea (BD) |

6	de Baaij (JA)	172
Cheema (AS)	171	Fuente (TDL)
138	Dembitsky (VM)	199
Chen (HC)	27	Fujio (Y)
24	Dennis (C)	66
Chinachoti (P)	1	Fukushima (A)
99	Diamante (LM)	34
Choudhary (R)	71	Gamroth (MJ)
63	Dias (CAR)	15
Chowdhry (S)	53	Gandhi (AP)
104	Dietz (HM)	64
Clifton (AB)	61	Gandhi (DK)
193	Dodeja (AK)	2
Clydesdale (FM)	9	Gawish (RA)
244	Dogantan (Z)	55
Cole (ME)	80	Georgiou (C)
107	Don-Pedro (KN)	57
Cole (RW)	56	Gholap (AS)
107	Drainas (C)	89
Crippen (KL)	92	Ghosh (BC)
156	Dull (GG)	135 136
Crowther (JB)	90	Gifford (SR)
194	Dupuy (HP)	244
Crupkin (M)	156	Giridharan (MP)
189	Dutt (N)	220
Csete (J)	227	Gonzalez (JM)
246	Dutta (B)	144
Curran (DM)	13	Gopakumar (K)
191	Dwivedi (BK)	192
Dabi (RK)	44	Gopalakrishnan (N)
232	Dymsza (HA)	217
Dail (R)	196	Gowrishankar (TM)
100	Eisele (TA)	184
Dail (RV)	201	Greaser (ML)
47	Eitenmiller (RR)	172
Damodaran (S)	175	Gruber (HA)
144	Ejiofor (AO)	157
Darmadji (P)	68	Gupta (BB)
160	Eswara Prasad (P)	202
Dasaratha Ramaiah (M)	165	Gupta (HC)
75	Faretra (F)	207 232
Dave (JM)	87	Gupta (JK)
115	Farouk (MM)	247
Dave (RI)	158	Gurdip Singh.
117	Fleisher (A)	219
David (BV)	209	Hagele (GH)
230	Forbus (WRJr)	171
Dawson (KH)	90	Haleem (MA)
206	Foster (SJ)	149 155
Dayrit (FM)	134	Haluska (RJ)
222 223	Foster-Smith (A)	98
Deb (DC)	161	Hamza-Chaffai (A)
235	Fritz (JD)	85

Hannigan (MV)	216	Kavadia (VS)
157	Ismond (MAH)	72 234 237
Haque (SA)	57	Keshri (RC)
124	Ito (T)	154 169 181 182
Haridas Rao (P)	148	Khanna (SK)
101 105	Izumimoto (M)	35
Harris (RV)	160	Khedkar (CD)
61	Jaffrin (MY)	115
Hart (H)	202	Kim Ha (J)
88	Jaime (I)	122
Haun (J)	173	King (AJ)
196	Jairam (BT)	183
Hayakawa (I)	109	King (RD)
66	James (CJr)	61
Hayakawa (K-I)	156	Kinsella (JE)
14	Janssen (FW)	245
Hayashi (N)	171	Klacik (K)
66	Jayaprakasha (HM)	96
Haydon (KD)	143	Klawitter (LA)
145 147	Jha (UN)	29
Hearnsberger (JO)	240	Kochhar (A)
190	Jha (V)	118
Heatherbell (DA)	240	Kondaiah (N)
205	Jimenez (M)	170
Helsel (Z)	86	Kopchik (FM)
167	Johnson (DE)	94
Heuser (JR)	107	Koutinas (AA)
201	Jolley (PD)	92
Hira (CK)	161	Kowale (BN)
118	Josephson (ES)	182
Hodgson (AS)	196	Krishna (N)
204	Kachru (RP)	109
Hoppe (T)	226	Krishna Murthy (MM)
225	Kadirvel (R)	40
Hsieh (TC-Y)	184	Krishna Reddy (K)
194	Kaletunc (G)	165
Hsu (J-C)	82	Krishnan (KR)
205	Kamisoyama (H)	151
Huang (S)	148	Kronick (PL)
88	Kanawjia (SK)	157
Huerta (T)	133 136	Krzynowek (J)
86	Kandalkar (HG)	193
Ibrahim N.	51	Kuila (RK)
166	Kapil (V)	114
Igarashi (Y)	9	Kumari (S)
229	Kapila (S)	130
Iglesias (HA)	166	Labots (H)
106	Karkare (UD)	17
Imai (R)	162	Ladkani (BG)
229	Katoaka (K)	129
Irwin (WE)	160	Latreille (B)
93	Kaul (CK)	20
Ismaiel (A)	233	Lawrence (BM)

210 212 213
 Laxmi Devi (L)
 239
 Laxminarayana (M)
 109
 Lee (CM)
 196
 Lee (H)
 88
 Leelavathi (K)
 101
 Leiras (MC)
 106
 Lekshmy Nair (A)
 192
 Lemieux (L)
 128 131
 Lim-Sylianco (CY)
 223
 Lin (CF)
 194
 Lin (TY)
 203
 Lindsay (RC)
 122
 Madhava Rao (T)
 109
 Mahapatra (CM)
 178
 Malik (AH)
 169
 Malik (RK)
 132
 Manjunath (GM)
 119
 MarGoshes (BA)
 187
 Marinos-Kouris (D)
 81
 Maroulis (ZB)
 81
 Masood Ahmed.
 111
 Mathur (BN)
 35 108 139 198 207
 Mathur (DK)
 132
 Mathur (MP)
 23
 Matte (NK)
 48
 Matthews (WA)
 43

Mattio (NDVD)
 189
 Maya Gowri (S)
 238
 Maya Prakash.
 102
 Mbofung (CMF)
 46
 McKenna (AB)
 121
 McGuire (J)
 15
 Mehrotra (P)
 233
 Men (UB)
 51
 Mietsch (F)
 146
 Miller (MF)
 145 147
 Minson (E)
 97
 Mishra (D)
 221
 Misra (AK)
 114
 Mistry (VV)
 134
 Miyamoto (T)
 160
 Mizutani (S)
 25
 Modi (VK)
 149 155
 Moffitt (HR)
 84
 Mohan Raj (AB)
 164
 Moncrieff (CB)
 174
 Mondy (NI)
 70
 Montville (TJ)
 191
 Moody (WG)
 159
 Moorthy (SN)
 69
 Morris (WC)
 241
 Morton (RD)
 28
 Moshonas (MG)

211
 Moutounet (M)
 199
 Mundiwale (SK)
 51
 Munro (PA)
 71
 Murphy (J)
 193
 Murray (ED)
 57
 Mushtari Begum (J)
 137
 Muzilla (M)
 167
 NPC Centre for Agricultural
 Productivity.
 58
 NPC Energy Management
 Division.
 18
 NPC Pollution Control Division.
 150
 Naes (T)
 195
 Naewbanij (JO)
 74
 Nagaraj (P)
 7
 Nagaraju (V)
 149
 Nair (PM)
 89
 Nair (RB)
 155
 Nakai (S)
 22
 Nanda Kumar (TB)
 60
 Narasinga Rao (BS)
 32
 Narayanan (CS)
 217 219
 Nath (G)
 73
 Nayar (VU)
 69
 Ndjouenkeu (R)
 46
 Neelakantan (S)
 208
 Nigam (MC)
 214
 Noble (A)

67	Patel (RS)	164
Nussinovitch (A)	143	Ramamurthy (N)
82	Pechenkina (EE)	184
Nute (GR)	27	Ramana (VV)
174	Peiro (JM)	75
O'Brien Nabors (L)	173	Ramasubbalah (K)
37	Peleg (M)	40
Okafor (N)	82	Ramaswami (AM)
68	Perera (CO)	164
Orban (E)	204	Rameshwar Singh.
197	Peri (C)	83
Ordorica-Falomir (C)	116	Rangarao (GCP)
62	Phillips (LG)	3 4
Ossa (EM)	245	Rao (AS)
200	Pierson (MD)	44
Outhwaite (RJ)	216	Rao (DN)
67	Prabha (PGS)	149 155
Owusu-Yaw (J)	236	Rao (KVSS)
243	Prajapathi (JB)	139
Padmakumari (KP)	117	Reagan (JO)
219	Prasad (RL)	145 147
Padmavathi (P)	153	Reid (DS)
239	Prasad (VSS)	77
Pagaria (LK)	163	Reineccius (GA)
26	Price (JF)	10 21
Pagliarini (E)	158	Rizzi (G)
116	Price (NR)	19
Palaniswami (A)	225	Romero (LI)
208	Puchades (R)	200
Pandey (NK)	128 131	Roncales (P)
178 188	Puri (MK)	173
Panduranga Setty (MK)	232	Ross (RE)
39	Puri (RK)	95
Pannu (DS)	166	Rozentsvet (OA)
23	Puttarajappa (P)	27
Pant (JC)	155	Sachdeva (S)
54	Quaglia (GB)	140 141 142
Paquin (P)	197	Sadeghi (F)
20	Querol (A)	11
Parathasarthy (S)	86	Sadler (G)
123	Raghavan (B)	211
Paredes-Lopez (O)	218	Sahay (SS)
62	Rahman (MF)	248
Paredi (ME)	248	Sahoo (J)
189	Rajore (RB)	180
Pariser (ER)	108	Saibu (LO)
193	Ramadoss (CS)	196
Parvathi Eswaran (P)	52	Saito (K)
238	Ramakrishna (M)	34
Patel (JD)	52	Salahuddin (M)
51	Ramakrishna (P)	170
Patel (RK)	224	Sales (D)
125	Ramamurthi (R)	200

Salih (AM)	179 185	Simard (RE)
158	Self (KP)	128 131
Saludares (LN)	174	Singh (H)
127	Sell (CR)	121
Sam Kuhl.	84	Singh (KM)
45	Seman (DL)	63
Samui (TN)	159	Singh (LN)
235	Senter (SD)	153
Sannabhadti (SS)	91	Singh (MN)
115	Shackelford (SD)	198
Santha (N)	145 147	Singh (R)
69	Shah (GH)	234 237
Santhana Krishnan (T)	79	Singh (RN)
33	Shaikh (NS)	63
Sarada (M)	162	Singh (RP)
137	Shamanthaka Sastry (MC)	49
Saradha (V)	101	Singh (S)
238	Shankaranarayana (ML)	130 133 135 136 140 141 142 143
Saraswathi (K)	218	Singh (SD)
75	Sharma (A)	233
Sarin (K)	42	Singh (SV)
42	Sharma (BD)	50 72
Sarma (SC)	168	Singh (YP)
9	Sharma (K)	50
Sarode (SV)	42	Singhee (KD)
78	Sharma (N)	38
Sarojani Dastur (K)	151 154 169 181 182	Siva Rao (DV)
102	Sharma (RP)	40
Sastry (SK)	30	Skrede (G)
13	Sharma (SK)	195
Satyanarayana Reddy (L)	232	Sowbhagya (CM)
186	Sharma (VK)	26
Saxena (RC)	19	Sreenivas Reddy (M)
83	Shaw (PE)	186
Saxena (VS)	211	Srinivasan (MR)
228	Sheard (PR)	129
Schanus (EG)	161	Srivastava (AK)
152	Sherikar (AT)	83
Schulz (LO)	162	Srivastava (AS)
246	Shivanna (BD)	50
Scott (VN)	52	Srivastava (KM)
28	Shoba (S)	54
Scrano (L)	239	Srivastava (MK)
87	Shrestha (KG)	73
Searcy (GK)	126	Srivastava (RP)
175	Shrivastava (AK)	83
Seetharaman (K)	248	Steffe (JF)
70	Siddiqui (SM)	47 100
Sehgal (KL)	186	Stekelenburg (FK)
49	Silerman (GJ)	17
Sehgal (SS)	196	Stengle (TR)
236	Silva (JL)	99
Sekhon (KS)	190	Stephen (J)

192	Tsami (E)	112
Stoforos (NG)	81	Watanabe (S)
77	Turk (RS)	229
Stone (MB)	113	Watkins (AS)
65 74 107	Tzeng (WC)	113
Storebakken (T)	120	Watson (H)
195	Uma Reddy (M)	225
Subramanian (MR)	239	Wei (CI)
5	Unklesbay (K)	243
Subramanian (P)	167	Welsh (FW)
132	Unklesbay (N)	206
Succar (J)	166 167	Wheeler (WB)
14	Upadhyay (R)	243
Sudha (KG)	219	Wicker (L)
69	Vadehra (DV)	88
Sudhir Singh.	247	Wiley (RC)
35	Valliappan (T)	28
Suwendu Bhattacharya.	208	Williams (JO)
102	Vasudeva (RY)	231
Suwardi (H)	149	Williams (RE)
110	Veerraju (P)	206
Swartzel (KR)	3	Xiong (YL)
11	Velinov (PD)	176 177
Talati (JD)	172	Yadav (PR)
2	Verma (JP)	76
Tanaka (H)	207	Yadav (SS)
148	Verma (SS)	76
Tepper (BJ)	178	Yadav (TD)
191	Vernile (M)	53
Thakur (BN)	116	Yagami (K)
126	Vijayakumari (KP)	229
Thakur (BR)	69	Yorgey (BM)
12	Vijayalakshmi (V)	205
Thompson (DK)	239	Yoshida (S)
108	Villasenor (IM)	148
Thyagarajan (D)	222 223	Zall (RR)
184	Vine (RP)	120
Tiwari (SC)	203	Zanjad (PN)
44	Voorpostel (AMB)	139
Toth (JP)	171	Zhang (WB)
243	Walsh (JJ)	242
Trehan (IR)	67	
12	Walstra (P)	

SUBJECT INDEX

- Acceptability**
 ham, monounsaturated fat fed swine & acceptability of boneless 145
 sausage, monounsaturated fat fed swine & acceptability of low-fat 147
- Acid**
 soy milk solid & acid production by *Lactobacillus* 65
- Acidophilus milk**
 bacterial growth inhibition during production/storage of acidophilus milk 115
- Actomyosin**
Aulacomya ater ater muscle, actomyosin biochemical properties of cold stored striated adductor 189
- Additive**
 food additive use in industry 33
 food additive-consumers view point 32
- Age**
 skim milk, age gelation in UHT-processed reconstituted concentrated 121
- Alcohol**
 confection, sugar alcohol in 95
- Algae**
 brown algae,
 glycolipid/phospholipid/fatty acid of 27
- Amino acid**
 Cheddar cheese, amino acid in 131
Euryale ferox, amino acid comp. of 240
- Analysis**
 generalised chart for breakeven analysis 224
- Animal**
 by-product, rendering of animal 149
- Antibacterial agent**
Moringa oleifera, antibacterial activity of 222
- Antimicrobial agent**
 N-(fluorophenyl)maleimide, antimicrobial activity of 229
 paneer, antimicrobial agent & chemical characteristics of 142
 paneer, antimicrobial agent & microbial quality of paneer 141
 paneer, antimicrobial agent & sensory properties of 140
- Antioxidant**
 beef, chemical/sensory properties of antioxidant-treated 156
- Apple**
 methyl bromide residue estimation in fumigated apple 84
- Apple fiber**
 heat treatment & chemical analysis of apple fiber 241
- Apple juice**
 clarification, mineral membrane for fouling control in apple juice 202
 D-malic acid
 separation/quantitation in apple juice 201
- Apricot**
 moisture sorption isotherm of dried apricot 80
 pulp, flow behaviour of apricot 79
 water sorption isotherm of apricot 81
- Apricot concentrate**
 concn. of Indian var. apricot conc. 79
- Aroma compound**
 microbial fermentation, aroma component development by 25
- Aseptic processing**
 corn starch solution, rheological properties of low acid aseptic 47
 starch, low acid aseptic processing & dilatancy in 100
- Aspergillus niger**
 N-(fluorophenyl)maleimide
 antifungal activity against *Asp. niger* 229
- Astaxanthin**
 rainbow trout,
 astaxanthin/canthaxanthin & colour evaluation in raw/baked/smoked flesh of 195
- Aulacomya ater ater**
 muscle, actomyosin biochemical properties of cold stored striated adductor *Aulacomya ater ater* 189
- Azo dye**
 toxicological evaluation of azo dye 35
- Bacillus subtilis**
 N-(fluorophenyl)maleimide
 antimicrobial activity against *B. subtilis* 229
- Bacterial quality**
 Cheddar cheese, bacteriological changes during ripening of buffalo milk 132
- Bakery product**
 sunflower kernel utilization in bakery products 101
- Baking**
 raw materials in baking 39
- Banana**
 gelified milk, manufacturing condition & rheology of banana 85
- Beef**
 batters, electrical
 stimulation/postmortem salting time & characteristics of beef 159
 chemical/sensory properties of antioxidant-treated beef 156
 connective-tissue components detn. in beef 157
 meat product, myoglobin analysis & beef/pork/horse/sheep/kangaroo
 meat detn. in blended cooked 171
 steak, edible collagen film
 overwrap & exudation/lipid oxidation in beef 158
- Bicarbonate**
 cod fillet, bicarbonate & microbial control/water-binding capacity improvement in 191
- Biochemical changes**
 Cheddar cheese, lipase & biochemical changes in buffalo milk 133
- Biotechnology**
 food demands & biotechnology 30
- Biscuit**
 industry, small scale biscuit 103
- Bleaching**
 menhaden oil, bleaching & volatiles removal from 194
- Boning**
 pork, boning & quality characteristics of 168
- Brassica oleracea**
 see Cabbage
- Bread**
 see also flat bread
 India, bread industry in 104
- Breadmaking**
 shortening/surfactant use in breadmaking 105
- Brinjal**
 endosulfan/carbaryl residue detn. in/on brinjal 72
- Broiler**
 meat sausage, frozen
 storage/extender & quality of broiler breeder male 185
- Buffalo**
 muscle, stroma protein in buffalo

- 153
skeletal/offal meat, quality of
buffalo 151
soup, sensory quality of buffalo
bone based 154
- Buffalo milk**
Cheddar cheese, bacteriological
changes during ripening of
buffalo milk 132
cheese, flavour compound changes
from buffalo milk based Emmental
type 129
electrodialysis & mineral
modification of buffalo milk 198
- By-product**
rendering of animal by-product 149
- Cabbage**
processing & malathion removal
from treated cabbage 73
- Cake**
mixes, water vapour sorption
isotherms of cake 106
- Calcium**
protein source, Ca/Zn/phytate
interaction with 244
- Callosobruchus analis**
legume seed, *C. analis*
ovipositional preference to 53
regulating factor for abundance
of *Callosobruchus analis* 236
- Callosobruchus chinensis**
legume seed, *C. chinensis*
ovipositional preference to 53
organophosphorus insecticide &
bioecology of *C. chinensis* 227
- Callosobruchus maculatus**
legume seed, *C. maculatus*
ovipositional preference to 53
vegetable oil insecticidal
activity against *C. maculatus* 56
- Candy**
colour development in candy 98
sugarless hard candy technology,
review 96
- Canthaxanthin**
rainbow trout, canthaxanthin &
colour evaluation in
raw/baked/smoked flesh of 195
- Carbaryl**
brinjal, carbaryl residue detn.
in/on 72
sesame, carbaryl residue
dissipation in 63
- Carbofuran**
rice, carbofuran & insect pests
of 40
- Carbon dioxide**
spice, supercritical carbon
dioxide extraction of 217
- Carcass**
duck carcasses, sex & Kashmir
dest 180
lamb, carcass characteristics of
normal/chyptorchid Mandya 165
- Carcinogenicity**
azo dye, carcinogenicity of 35
- Cardamom**
supercritical carbon dioxide
extraction of cardamom 217
- Carthamin**
polymer, carthamin thermal
stability bound to insoluble 34
- Casein**
micelles, stability of casein 112
soy-protein-casein, quality of
rennet curd incorporated 109
- Cashew nut**
nutritive value of cashew nut 59
- Casing**
sausage casing & ripening/sensory
quality of mould-covered dry 173
- Cassava**
mash, detoxification of cassava 68
- Cassava starch**
Raman/infrared spectra of cassava
starch 69
- Catfish**
product, fish state/mixing time &
texture of restructured catfish
190
- Centrifugation**
emulsion stability,
centrifugation & evaluation of 20
- Cereal**
milk, Fe utilization from
cereal-legume diets supplemented
with 118
- Cheddar cheese**
amino acid in Cheddar cheese 131
buffalo milk Cheddar cheese,
bacteriological changes during
ripening of 132
condensed milk, Cheddar cheese
from 134
lipase & flavour/biochemical
changes in buffalo milk Cheddar
cheese 133
- Cheese**
Emmental type cheese, flavour
compound changes from buffalo
milk based 129
Mozzarella cheese, storage temp.
& characteristics of 135
amino acid detn. flow injection
analysis in cheese 128
fatty acid analysis in cheese 122
- Chemical composition**
citrus oil, chem. comp. of 215
- Chemical control**
podborer, chemical control of 233
- Chemical properties**
beef, chemical properties of
antioxidant-treated 156
- Chicken**
breast meat, pressure
cooking/vacuum cooling &
quality/yield of chicken 174
breast/leg muscle, tocopherol
detn. RPLC in chicken 175
egg, functional properties of
chicken 186
kababs, maida/potato/textured
soya & quality of chicken 170
muscle, salt-soluble protein
thermal transition from
pre-/post-rigor chicken 176
muscle, stroma in chicken 153
protein, physicochemical/gelation
properties of pre-/post-rigor
chicken salt-soluble 177
sausage, enterotoxigenic
staphylococci in chicken 178
- Chilli**
supercritical carbon dioxide
extraction of chilli 217
- Chlorine**
tryptophan reaction with
chlorine/chlorine dioxide 243
- Chlorpyrifos-methyl**
wheat, chlorpyrifos-methyl in
stored 43
- Cholesterol**
pork/soy hull mixture,
cholesterol content of
restructured 166
- Cholesterol oxide**
tallow, cholesterol oxide level
dielectric measurement in heated
242
- Cinnamomum tamala**
essential oil of *Cinnamomum*
tamala 214
- Citric acid**
food colourant, zinc corrosion &
citric acid containing 2
- Citrus oil**
chem. comp. of citrus oil 215
- Clarification**
apple juice clarification,
mineral membrane for fouling
control in 202
- Cleaning**
elipsometry to evaluate surface
cleaning effectiveness 15
- Clostridium botulinum**
spice essential oil &
growth/germination inhibition in

- Cl. botulinum 216
- Clostridium butyricum**
heat/pH effect on toxigenic Cl. butyricum 28
- Clove**
supercritical carbon dioxide extraction of clove 217
- Coating**
mutton, cetyl alcohol glycerine emulsion coating & moisture conservation in cold stored 164
sucrose-free confectionery coating 97
- Coconut oil**
copra fungal contamination & quality of coconut oil 208
- Coconut water**
properties/therapeutic value of tender coconut water 60
- Cod**
fillet, bicarbonate & microbial control/water-binding capacity improvement in cod 191
- Collagen**
beef steak, edible collagen film overwrap & exudation/lipid oxidation in 158
- Colour**
candy, colour development in 98
lychee, enzymatic/colour change during post-harvest storage of 88
meat, frozen storage & colour stability in restructured 152
milk, heat & colour changes in 116
rainbow trout, astaxanthin/canthaxanthin & colour evaluation in raw/baked/smoked flesh of 195
- Colourant**
sausage, stable natural colourant for 148
zinc corrosion & citric acid containing food colourant 2
- Concentration**
whey, concn. of 143
- Confectionery**
sugar alcohol/alternative sweeteners in confection 95
- Contamination**
coconut oil, copra fungal contamination & quality of 208
- Cookie**
sunflower protein isolate & characteristics of cookie 62
- Cooking**
chicken breast meat, pressure cooking & quality/yield of 174
cowpea, cooking quality of 55
rabbit meat patties, vegetable fat & cooking quality of 169
- Cooling**
chicken breast meat, pressure cooking/vacuum cooling & quality/yield of 174
- Copper**
alcohol production, raisin extract fermentation & copper in 92
- Copra**
coconut oil, copra fungal contamination & quality of 208
- Corn fiber**
heat treatment & chemical analysis of corn fiber 241
- Corn flour**
milling method/peanut extract & Fe availability from corn flour gruel 46
- Corn starch**
solution, rheological properties of low acid aseptic corn starch 47
- Cowpea**
nutritional evaluation/cooking quality of cowpea 55
- Cubiceps natalensis**
see Fish
- Cucumber**
extract, salt & Lactobacillus plantarum/Enterobacter cloacae growth in cucumber 74
- Curd**
soy-protein-casein, quality of rennet curd incorporated 109
- Currant**
water sorption isotherm of dried currant 81
- Cyamopsis tetragonolobus**
see Guar
- Cyclodextrin**
limonene/carvone enantiomer, interaction of beta-cyclodextrin with 21
- Dairy industry**
Indonesia, dairy industry development in 110
Pakistan's dairy industry 111
Philippine, dairy industry of 127
- Degradation**
sorbic acid, radiolytic degradation of 12
- Dendeng gilling**
lactic fermentation & preservative quality of dendeng gilling 160
- Deodorization**
Menhaden oil, deodorization & volatiles removal from 194
- Deoxynivalenol**
Fusarium, deoxynivalenol producing strain of 248
- Detoxification**
cassava mash, detoxification of 68
- Dicarboximide**
grape, dicarboximide residue evaluation in cold-stored 87
- Diet**
rural/urban adult population, high fibre diet & blood lipid profile of 238
- Dietary fiber**
heat treatment & chemical analysis of dietary fiber 241
- Dimethoate**
fruit/vegetable, dimethoate detn. in 67
- Distilleries**
energy conversion in distilleries 18
- Dried food**
fruit, moisture sorption isotherm of dried 80
- Drying**
sweet potato slices, hot air drying of 71
whey, drying of 143
- Duck**
carcasses, sex & Kashmir desi duck 180
egg, functional properties of duck 186
- Egg**
functional properties of chicken/duck egg 186
nutritional adequacy of egg-based food 188
white leghorn pullets, phase feeding & egg quality in 184
- Egg white**
gel, protein sulfhydryls & strength of heat-formed egg white 187
- Egg white protein**
gel, protein sulfhydryls & strength of heat-formed egg white 187
- Electrical stimulation**
beef batters, electrical stimulation & characteristics of 159
- Ellagic acid**
grape juice, ellagic acid identification/reduction in Muscadine 203
- Emulsifying properties**
sardine protein hydrolysate, enzymatic hydrolysis & structure/emulsifying properties of 197
- Emulsion**

- centrifugation & evaluation of emulsion stability 20
- Encapsulation**
spice/flavour material, encapsulation of 218
- Endosulfan**
brinjal, endosulfan residue detn. in/on 72
okra, endosulfan degradation in unprocessed/processed 76
sorghum, endosulfan residue in 50
- Energy conservation**
distilleries, energy conservation in 18
- Enology**
must, enological parameters during fermentation of 86
- Enterobacter cloacae**
cucumber extract, salt & E. cloacae growth in 74
- Environment**
insecticide & environment 234
- Enzyme**
foodstuff, enzyme inactivation during heat processing of 16
sardine protein hydrolysate, enzymatic hydrolysis & structure/emulsifying properties of 197
- Escherchia coli**
N-(fluorophenyl)maleimide antimicrobial activity against E. coli 229
- Escherichia coli**
acidophilus milk, E. coli growth inhibition during production/storage of 115
- Essential oil**
Cinnamomum tamala, essential oil of 214
Clostridium botulinum, spice essential oil & growth/germination inhibition in 216
Foeniculum vulgare, essential oil chem. investigation of 219
orange, storage controlled atm. & essential oil enhancement in 211
progress in essential oil 210 212 213
Zingiber officinale, essential oil insecticidal property of 221
- Ethyl alcohol**
cane molasses fermentation to ethanol 24
raisin extract fermentation & copper in alcohol production 92
- Euryale ferox**
nutritional evaluation of Euryale ferox 240
- Extender**
meat sausage, extender & quality of culled hen/broiler breeder male 185
meat tikkas, extender & quality of culled hen/broiler 179
- Extraction**
flavour industry, poroplast extraction technique in 209
rapeseed, glucosinolate, aqueous extraction from 61
spice, supercritical carbon dioxide extraction of 217
- Faba bean**
noncovalent forces & micellization using faba bean legumin 57
- Fat**
food/nutrition & fat intake by low income population of Hyderabad/Secunderabad 239
ham, monounsaturated fat fed swine & acceptability of boneless 145
sausage, monounsaturated fat fed swine & acceptability of low-fat 147
- Fat milk**
fatty acid analysis in milk fat 122
- Fatty acid**
brown algae, fatty acid of 27
cheese/milk fat, fatty acid analysis in 122
- Fenitrothion**
tomato, processing & fenitrothion residue in 78
- Fermentation**
alcohol production, raisin extract fermentation & copper in 92
dendeng gilling, lactic fermentation & preservative quality of 160
ethanol, cane molasses fermentation to 24
microbial fermentation, aroma component development by 25
- Fig**
moisture isotherm of dried fig 80
water sorption isotherm of fig 81
- Finfish**
potential fish oil source 193
- Fish**
Cubiceps natalensis, nutritive value of edible meat from 192
mince, gamma-irradiation & shelf-life/gel forming properties of washed red hake 196
- fish 196
muscle, stroma protein in fish 153
- Flat bread**
see Khakra
- Flavour**
Cheddar cheese, lipase & flavour in buffalo milk 133
cheese, flavour compound changes from buffalo milk based Emmental type 129
industry, poroplast extraction technique in flavour 209
mango, flavour changes in irradiated Alphonso 89
material, encapsulation of flavour 218
prediction of flavour retention during spray drying 10
- Foeniculum vulgare**
essential oil chem. investigation of Foeniculum vulgare 219
- Freezing**
food, initial freezing point of 14
- Fruit**
dimethoate detn. in fruit 67
insecticide residue in fruit 83
- Fruit juice**
alginate texturization of highly acid fruit juice 82
- Fungi**
coconut oil, copra fungal contamination & quality of 208
- Fusarium**
poultry, Fusarium effect on 247
toxin producing strain of Fusarium 248
- Galactosidase**
guar, alpha-galactosidase purification/properties of germinating 52
- Gel**
fish mince, gamma-irradiation & gel forming properties of washed red hake 196
- Gelation**
chicken salt-soluble protein, gelation properties of pre-/post rigor 177
myofibrillar protein/sausage, blood plasma/globin & heat induced gelation of 146
- Ginger**
Zingiber officinale, essential oil insecticidal property of 221
gamma-irradiation & yield/quality of ginger 220
supercritical carbon dioxide extraction of ginger 217
- Glucosinolate**

- rapessed, glucosinolate, aqueous extraction from 61
- Glycoalkaloid**
potato, irradiation & total glycoalkaloid in Kennebec/Russet Burbank 70
- Glycolipid**
brown algae, glycolipid of 27
- Goat**
soup, sensory quality of goat/buffalo bone based 154
- Grape**
dicarboximide residue evaluation in cold-stored grape 87
- Grape juice**
D-malic acid separation/quantitation in grape juice 201
Muscadine grape juice, ellagic acid identification/reduction in 203
- Groundnut**
corn/sorghum flour gruel, milling method/peanut extract & Fe availability from 46
- Guar**
alpha-galactosidase purification/properties of germinating guar 52
- Guava juice**
clarified guava juice, physico-chemical characteristics of partially 204
- Guava juice concentrate**
physico-chemical characteristics of guava juice conc. 204
- Hake**
red hake fish mince, gamma-irradiation & shelf-life/gel forming properties of washed 196
- Ham**
monounsaturated fat fed swine & acceptability of boneless ham 145
- Heat**
Clostridium butyricum, heat effect on toxigenic 28
dietary fiber, heat treatment & chemical analysis of 241
foodstuff, enzyme inactivation during heat processing of 16
myofibrillar protein/sausage, blood plasma/globin & heat induced gelation of 146
- Heat exchanger**
whey, thin film scraped surface & heat transfer during concn. of 9
- Heat transfer**
whey, thin film scraped surface heat exchanger & heat transfer during concn. of 9
- Heliiothis armigera**
insecticide sub-lethal effect on Heliiothis armigera 232
- Hen**
meat sausage, frozen storage extender & quality of culled hen 185
- Hexachlorocyclohexane**
Tribolium castaneum, alpha-hexachlorocyclohexane effect on DDT resistant 228
- High temperature short time processing**
pasta, HTST processing of 107
- Hormone**
insect pest, hormonal control of 235
- Horse**
meat product, myoglobin analysis & beef/pork/horse/sheep/kangaroo meat detn. in blended cooked 171
- Hydrolysis**
lactose hydrolysis, process alternative for 108
sardine protein hydrolysate, enzymatic hydrolysis & structure/emulsifying properties of 197
- Hygrometer**
water activity, electric hygrometer & measurement of 17
- Ice-cream**
manufacture of filled ice-cream 138
microbial quality of ice-cream, Bangalore 137
- Idli**
rice var./parboiling/aging & texture of idli 26
- Industry**
bread industry in India 104
food additive use in industry 33
milling industry 38
small scale biscuit industry 103
- Infestation control**
wheat, non-edible oil as grain protectant in 207
- Insect**
hormonal control of insect pest 235
pest control, technologies in insect 230
rice, insecticide & insect pests of 40
- Insecticide**
Callosobruchus chinensis, organophosphorus insecticide & bioecology of 227
- Callosobruchus maculatus**, vegetable oil insecticidal activity against 56
- environment 234
- fruit/vegetable, insecticide residue in 83
- Heliiothis armigera, sub-lethal dose insecticidal effect on 232
- rice, insecticide & insect pests of 40
- sunlight & residual toxicity/persistence of insecticide 237
- Zingiber officinale, essential oil insecticidal property of 221
- Iron**
leafy vegetable, iron detn. spectrophotometry in green 75
milk, Fe utilization from cereal-legume diets supplemented with 118
- Irradiation**
fish mince, gamma-irradiation & shelf-life/gel-forming properties of washed red hake 196
ginger, gamma-irradiation & yield/quality of 220
mango, lipid comp./flavour changes in irradiated Alphonso 89
potato, irradiation & total glycoalkaloid in Kennebec/Russet Burbank 70
- Isomalt**
reduced calorie bulk ingredient 93
- Kangaroo**
meat product, myoglobin analysis & beef/pork/horse/sheep/kangaroo meat detn. in blended cooked 171
- Khakra**
storage of khakra 102
- Labelling**
food package labelling 4
- Lactobacillus**
acid production by Lactobacillus & soy milk solid 65
dendeng gilling, lactic fermentation & preservative quality of 160
- Lactobacillus plantarum**
cucumber extract, salt & L. plantarum growth in 74
- Lactoglobulin**
succinylation & foaming properties of beta-lactoglobulin 245
- Lactoperoxidase**
milk, lactoperoxidase system &

- shelf-life enhancement of 117
- Lactose**
hydrolysis, process alternative for lactose 108
- Lamb**
carcass characteristics of normal/chyptorchid Mandya lamb 165
- Leafy vegetable**
iron detn. spectrophotometry in green leafy vegetable 75
- Legume**
Callosobruchus chinensis growth/developmental response to pulse 54
milk, Fe utilization from cereal-legume diets supplemented with 118
seeds, pulse beetle ovipositional preference to legume 53
- Legumin**
faba bean legumin, noncovalent forces & micellization using 57
- Lipase**
Cheddar cheese, lipase & flavour/biochemical changes in buffalo milk 133
flavour ester, lipase mediated synthesis of low molecular wt. 206
- Lipid**
beef steak, edible collagen film overwrap & lipid oxidation in 158
mango, lipid comp. in irradiated Alphanso 89
meat, frozen storage & lipid oxidation/colour stability in restructured 152
pigeon meat, lipid fractions of 182
- Liquid chromatography**
chicken breast/leg muscle, tocopherol detn. RPLC in 175
- Listeria monocytogenes**
temp./oxygen & growth of *L. monocytogenes* 29
- Lychee**
enzymatic/colour change during post-harvest storage of lychee 88
- Malathion**
cabbage, processing & malathion removal from treated 73
- Malic acid**
fruit juice, D-malic acid separation/quantitation in 201
- Mango**
lipid comp./flavour changes in irradiated Alphanso mango 89
- Marketing**
milk product, policy support & marketing of indigenous 123
- Maturation**
peach, maturation & tannin/phenol in 91
- Maturity**
peach maturity, delayed light emission as indicator of 90
- Meat**
culled sheep meat yield 163
flaked meat, particle size distribution of 161
frozen storage & lipid oxidation/colour stability in restructured meat 152
preservation of meat 155
- Meat products**
confocal scanning optical microscopy of meat products 172
myoglobin analysis & beef/pork/horse/sheep/kangaroo meat detn. in blended cooked meat product 171
- Menhaden oil**
refining/bleaching/deodorization & volatiles removal from Menhaden oil 194
- Methacrifos**
grain protectant, methacrifos as 225
- Methyl bromide**
apple, methyl bromide residue estimation in fumigated 84
- Micelles**
case in micelles, stability of 112
- Microbial quality**
ice cream, microbial quality of, Bangalore 137
must, microbial parameters during fermentation of 86
paneer, antimicrobial agent & microbial quality of 141
- Microfiltration**
wine, polysaccharide & cross-flow microfiltration of red 199
- Microorganism**
cod fillet, bicarbonate & microbial control in 191
fermentation, aroma component development by microbial 25
- Microscopy**
meat product, confocal scanning optical microscopy of 172
- Microwave**
turkey meat, NaCl/KCl & rancidity of microwave heated dark 183
- Milk**
bifidus milk 114
condensed milk, Cheddar cheese from 134
heat & colour changes in milk 116
lactoperoxidase system & shelf-life enhancement of milk 117
polymers to clean ultrafiltration membrane fouled with milk 120
proteinase activity in milk 119
- Milk product**
Bangladesh, indigenous milk product of 124
India, indigenous milk product of 125
Nepal, indigenous dairy product of 126
indigenous milk product of Philippine 127
policy support & developing/marketing of indigenous milk product 123
- Milling**
corn/sorghum flour gruel, milling method/peanut extract & Fe availability from 46
industry, milling 38
raw materials in milling 39
wheat for semolina/flour, milling hard amber 45
- Mineral**
buffalo milk, electrodialysis & mineral modification of 198
- Mineral membrane**
apple juice clarification, mineral membrane for fouling control in 202
- Moisture**
fruit, moisture sorption isotherm of dried 80
mutton, cetyl alcohol glycerine emulsion coating & moisture conservation in cold stored 164
pork/soy hull mixture, moisture content & density/heat capacity/conductivity of restructured 167
soy protein isolate, moisture content & flow behaviour of molten 66
- Molasses**
ethanol, cane molasses fermentation to 24
- Monocrotophos**
sorghum, monocrotophos residue in 50
- Moringa oleifera**
antibacterial activity of Moringa

- oleifera 222
seed, thermal degradation of
roasted *Moringa oleifera* 223
- Mozzarella cheese**
rheological properties of
Mozzarella cheese, review 136
- Muscle**
buffalo/rabbit/chicken/fish
muscle, stroma protein in 153
chicken leg muscle, tocopherol
detn. in RPLC in 175
chicken muscle, salt-soluble
protein thermal transition from
pre-/post rigor 176
pigeon muscle protein,
fractionation/quantitation of 181
- Must**
microbiological/enological
parameters during fermentation
of must 86
- Mutton**
cetyl alcohol glycerine emulsion
coating & moisture conservation
in cold stored mutton 164
kababs, maida/potato/textured
soya & quality of mutton 170
sausage, preparation of mutton 162
- N-(fluorophenyl)maleimide**
antimicrobial activity of
N-(fluorophenyl)maleimide 229
- Nutmeg**
supercritical carbon dioxide
extraction of nutmeg 217
- Nutrition**
Bangladesh, nutrition concerns in
246
fat intake by low income
population of
Hyderabad/Secunderabad &
nutrition 239
- Nutritional evaluation**
Euryale ferox, nutritional
evaluation of 240
cowpea, nutritional evaluation of
55
- Nutritional value**
Cubiceps natalensis, nutritive
value of edible meat/fish meal
from 192
cashewnut, nutritive value of 59
egg-based food, nutritional
adequacy of 188
- Oat bran**
heat treatment & chemical
analysis of oat bran 241
- Oil**
Callosobruchus maculatus,
vegetable oil insecticidal
activity against 56
production/availability of Indian
oil 58
- Oilseed**
production/availability of Indian
oilseed 58
- Okra**
endosulfan degradation in
unprocessed/processed okra 76
- Oleoresin**
ginger, gamma-irradiation &
oleoresin of 220
- Onchorhynchus mykiss**
see Rainbow trout 195
- Orange**
storage controlled atm.
essence/essential oil
enhancement in orange 211
- Oxidation**
beef steak, edible collagen film
overwrap & lipid oxidation in 158
- Packaging**
food packaging in India 3
food packaging, emerging trends
in 6
food, packaging of 5
horticultural/marine products,
packaging of 7
- Paneer**
antimicrobial agent & chemical
characteristics of paneer 142
antimicrobial agent & microbial
quality of paneer 141
antimicrobial agent & sensory
properties of paneer 140
- Papain**
tetrathionate & proteolytic
activity of simulated papain 22
- Parboiling**
idli, rice parboiling & texture
of 26
- Pasta**
HTST pasta processing 107
- Patty**
rabbit meat patties, vegetable
fat & quality of 169
- Peach**
maturation & tannin/phenol in
peach 91
maturity, delayed light emission
as indicator of peach 90
pulp, flow behaviour of peach 79
- Peach concentrate**
concn. of Indian var. peach conc.
79
- Pear juice**
D-malic acid
separation/quantitation in pear
juice 201
var./maturity/processing &
quality/protein stability of
pear juice 205
- Pearl millet protein**
fraction, characterization of
pearl millet protein 48
- Penicillium citrinum**
N-(fluorophenyl)maleimide
antifungal activity of *P.*
citrinum 229
- Pepper**
supercritical carbon dioxide
extraction of pepper 217
- Pest**
rice, insecticide & insect pests
of 40
sorghum pest, synthetic
pyrethroid against 51
- Pest control**
insect pest control, technologies
in 230
- Phenol**
peach, maturation & phenol in 91
- Phosphamidon**
sorghum, phosphamidon residue in
50
- Phospholipid**
brown algae, phospholipid of 27
- Phytate**
protein source, Ca/Zn/phytate
interaction with 244
- Pigeon**
meat, lipid fractions of pigeon
182
muscle protein,
fractionation/quantitation of
pigeon 181
- Polydextrose**
reduced calorie bulk ingredient 94
- Polysaccharide**
wine, polysaccharide & cross-flow
microfiltration of red 199
- Popcorn**
popping quality screening in
popcorn 49
- Popping**
popcorn, popping quality
screening in 49
- Pork**
boning/storage & quality
characteristics of pork 168
meat product, myoglobin analysis
& beef/pork/horse/sheep/kan-
garoo
meat detn. in blended cooked 171
soy hull mixture, moisture
content & density/heat
capacity/conductivity of
restructured pork 167
soy mixture, cholesterol content
of restructured pork 166
- Potassium chloride**
turkey meat, KCl & rancidity of

- microwave heated dark 183
- Potato**
irradiation & total glycoalkaloid in Kennebec/Russet Burbank potato 70
kababs, potato & quality of chicken/mutton 170
- Poultry**
Fusarium effect on poultry 247
- Preservation**
meat, preservation of 155
- Preservative**
dendeng gilling, lactic fermentation & preservative quality of 160
- Processing**
cabbage, processing & malathion removal from treated 73
integrated agro-storage-cum-processing complex 226
pasta, HTST processing of 107
pear juice, processing & quality/protein stability of 205
quality & processing 1
- Protease**
Withania coagulans, protease from 23
- Protein**
blood plasma/globin & heat induced gelation of myofibrillar protein 146
buffalo/rabbit/chicken/fish muscle, stroma protein in 153
Ca/Zn/phytate interaction with protein source 244
pear juice, var./maturity/processing & protein stability of 205
pigeon muscle protein, fractionation/quantitation of 181
- Proteinase**
milk, proteinase activity in 119
- Proteins animal**
chicken muscle, salt-soluble protein thermal transition from pre-/post rigor 176
chicken salt-soluble protein, physicochemical/gelation properties of pre-/post rigor 177
- Proteins fish**
sardine protein hydrolysate, enzymatic hydrolysis & structure/emulsifying properties of 197
- Proteins milk**
whey, solid state sulfitolysis & protein recovery from raw sweet 144
- Proteolysis**
papain, tetrathionate & proteolytic activity of simulated 22
soy cheese slurries, proteolysis in 130
- Pseudomonas aeruginosa**
N-(fluorophenyl)maleimide antimicrobial activity against Ps. aeruginosa 229
- Psyllium**
stabilizer 36
- Pulp**
fruit pulp, alginate texturization of highly acid 82
- Pyrethroid**
sorghum pest, synthetic pyrethroid against 51
- Quality**
chicken breast meat, pressure cooking/vacuum cooling & quality of 174
ginger, gamma-irradiation & quality of 220
kababs, maida/potato/textured soya & quality of chicken/mutton 170
meat tikkas, extender & quality of hen/broiler 179
popcorn, popping quality screening in 49
pork, boning/storage & quality characteristics of 168
processing & quality 1
ready-to-eat mutton block, quality of 163
- Rabbit**
meat patties, vegetable fat & quality of rabbit 169
muscle, stroma in rabbit 153
- Rainbow trout**
astaxanthin/canthaxanthin & colour evaluation in raw/baked/smoked flesh of rainbow trout 195
- Raisin**
alcohol production, raisin extract fermentation & copper in 92
moisture sorption of dried raisin 80
water sorption isotherm of raisin 81
- Rancidity**
turkey meat, NaCl/KCl & rancidity of microwave heated dark 183
- Rapeseed**
glucosinolate aqueous extraction from rapeseed 61
- Raw material**
milling/baking, raw materials in 39
- Ready-to-eat food**
mutton block, quality of ready-to-eat 163
- Refining**
Menhaden oil, refining & volatiles removal from 194
- Rennet**
calf rennet, thermal inactivation analysis in 113
casein-soy-protein, quality of rennet curd incorporated 109
- Residue**
apple, methyl bromide residue estimation in fumigated 84
brinjal, endosulfan/carbaryl residue detn. in/on 72
fruit/vegetable, insecticide residue in 83
grape, dicarboximide residue evaluation in cold-stored 87
tomato, processing & fenitrothion residue in 78
triticale, 2,4-D residue detn. in 41
wheat, chlorpyrifos-methyl in stored 43
- Rheological properties**
Mozzarella cheese, storage temp. & rheological properties of 135
banana gelified milk, manufacturing condition & rheological properties of 85
cheese, rheological properties of Mozzarella, review 136
corn starch solution, rheological properties of low acid aseptic 47
- Rheological property**
peach/apricot pulp, flow behaviour of 79
soy protein isolate, moisture content & flow behaviour of molten 66
- Rhizopertha dominica**
wheat, storage period & R. dominica effect on 44
- Rice**
idli, rice var./parboiling/aging & texture of 26
insecticide & insect pests of rice 40
- Ripening**
Cheddar cheese, bacteriological changes during ripening of buffalo milk 132
- Salt**
cucumber extract, salt & Lactobacillus

- plantarum/*Enterobacter cloacae* growth in 74
- Sardine**
protein hydrolysate, enzymatic hydrolysis & structure/emulsifying properties of sardine 197
- Sardinea pilchardus***
see Sardine
- Sausage**
blood plasma/globin & heat induced gelation of sausage 146
casing & ripening/sensory quality of mould-covered dry sausage 173
chicken sausage, enterotoxigenic staphylococci in 178
meat sausage, frozen storage/extender & quality of culled hen/broiler breeder male 185
monounsaturated fat fed swine & acceptability of low-fat sausage 147
mutton sausage, preparation of 162
stable natural colourant for sausage 148
- Semolina**
milling hard amber durum wheat for semolina 45
- Sensitivity**
generalised chart for sensitivity/breakeven analysis 224
- Sensory properties**
Mozzarella cheese, storage temp. & chemical properties of 135
beef, sensory properties of antioxidant-treated 156
paneer, antimicrobial agent & sensory properties of 140
- Sensory quality**
rabbit meat patties, vegetable fat & sensory quality of 169
sausage, casing & sensory quality of mould-covered dry 173
soup, sensory quality of goat/buffalo bones based 154
- Sesame**
carboxyl residue dissipation in sesame 63
- Sesamum indicum***
see Sesame
- Sheep**
meat product, myoglobin analysis & beef/pork/horse/sheep/kan-garoo
meat detn. in blended cooked 171
171
- Shelf life**
fish mince, gamma-irradiation of shelf-life of washed red hake 196
- Shortening**
breadmaking, shortening use in 105
- Sitophilus oryzae***
wheat, storage period & *S. oryzae* effect on 44
- Sitosterol**
Tribolium castaneum, sitosterol & biology of 42
- Skim milk**
age, gelation in UHT-processed reconstituted concentrated skim milk 121
- Slaughter house**
cost/control & pollution from slaughter house 150
- Soaking**
soybean, presoaking & thermal softening of 64
- Sodium chloride**
turkey meat, NaCl & rancidity of microwave heated dark 183
- Sorbic acid**
radiolytic degradation of sorbic acid 12
- Sorghum**
pest, synthetic pyrethroid against sorghum 51
phosphamidon/endosulfan/monocrotophos residue in sorghum 50
- Sorghum flour**
milling method/peanut extract & Fe availability from sorghum flour gruel 46
- Soup**
sensory quality of goat/buffalo bones based soup 154
- Soy cheese**
slurries, proteolysis in soy cheese 130
- Soy fiber**
heat treatment & chemical analysis of soy fiber 241
- Soy milk**
acid production by *Lactobacillus* & soy milk solid 65
- Soy protein**
casein-soy-protein, quality of rennet curd incorporated 109
isolate, moisture content & flow behaviour of molten soy protein 66
- Soybean**
pork/soy hull mixture, cholesterol content of restructured 166
pork/soy hull mixture, moisture content & density/heat capacity/conductivity of restructured 167
pre-soaking & thermal softening of soybean 64
- Spectrophotometry**
leafy vegetable, iron detn. spectrophotometry in green 75
- Spice**
encapsulation of spice 218
essential oil of spice & growth/germination inhibition of *Clostridium botulinum* 216
supercritical carbon dioxide extraction of spice 217
- Spray drying**
flavour retention during spray drying, prediction of 10
- Stability**
pear juice, var./maturity/processing & protein stability of 205
- Stabilizer**
psyllium 36
- Staphylococcus aureus***
N-(fluorophenyl)maleimide antimicrobial activity against *Staph. aureus* 229
acidophilus milk, *Staph. aureus* growth inhibition & production/storage of 115
- Starch**
low acid aseptic processing & dilatancy in starch 100
sucrose/starch system, water mobility in 99
- Storage**
Mozzarella cheese, storage temp. & characteristics of 135
acidophilus milk, bacterial growth inhibition during production/storage of 115
integrated agro-storage-cum-processing complex 226
khakra, storage of 102
lychee, enzymatic/colour change during post-harvest storage of 88
pork, boning & quality characteristics of 168
wheat, chlorpyrifos-methyl in stored 43
wheat, storage period & insect effect on 44
- Storage cold**
grape, dicarboximide residue evaluation in cold-stored 87
- Storage controlled atmosphere**
orange, storage controlled atm. & essence/essential oil enhancement in 211

- Storage frozen**
meat sausage, frozen
storage/extender & quality of
culled hen/broiler breeder male
185
meat, frozen storage & lipid
oxidation/colour stability in
restructured 152
- Succinylation**
beta-lactoglobulin, succinylation
& foaming properties of 245
- Sucrose**
confectionery, coating
sucrose-free confectionery 97
starch/sucrose system, water
mobility in 99
- Sugarcane**
ethanol, cane molasses
fermentation to 24
- Sunflower**
bakery products, sunflower kernel
utilization in 101
- Sunflower protein**
cookie, sunflower protein isolate
& characteristics of 62
- Surfactant**
breadmaking, surfactant use in 105
- Sweet potato**
slices, hot air drying of sweet
potato 71
- Sweet potato starch**
Raman/infrared spectra of sweet
potato starch 69
- Sweetener**
confection, alternative sweetener
in 95
- Tallow**
cholesterol oxide level
dielectric measurement in heated
tallow 242
- Tannin**
peach, maturation & tannin in 91
- Tetrathionate**
papain, tetrathionate &
proteolytic activity of
simulated 22
- Texture**
fish product, fish state/mixing
time & texture of restructured
190
idli, rice var./parboiling/aging
& texture of 26
- Textured soya**
kababs, textured soya & quality
of chicken/mutton 170
- Texturization**
fruit pulp/juice, alginate
texturization of highly acid 82
- Thermal inactivation**
calf rennet, thermal inactivation
analysis in 113
- Thermal processing**
Moringa oleifera seed, thermal
degradation of roasted 223
time-temp. equivalence of
discrete particles during
thermal processing 11
- Thermal stability**
polymer, carthamin thermal
stability bound to insoluble 34
- Tikkas**
hen/broiler meat tikkas, extender
& quality of culled 179
- Tissue**
beef, connective-tissue
components detn. in 157
- Tocopherol**
chicken breast/leg muscle,
tocopherol detn. RPLC in 175
- Tomato**
ketchup, serum separation
potential test evaluation of
tomato 77
processing & fenitrothion
residues in tomato 78
- Toxicity**
azo dye, toxicological evaluation
of 35
insecticide, sunlight & residual
toxicity of 237
- Toxin**
Fusarium, toxin producing strain
of 248
- Tribolium castaneum**
alpha-hexachlorocyclohexane
effect on DDT resistant Tr.
castaneum 228
methacrifos effect on Tr.
castaneum 225
sitosterol & biology of Tribolium
castaneum 42
temp./humidity & biology of Tr.
castaneum 231
wheat, storage period & Tr.
castaneum effect on 44
- Triticale**
2,4-D residue detn. in triticale
41
- Tryptophan**
chlorine/chlorine dioxide,
tryptophan reaction with 243
- Turkey**
meat, NaCl/KCl & rancidity of
microwave heated dark turkey 183
- UHT milk**
skim milk, age gelation in
UHT-processed reconstituted
concentrated 121
- Ultrafiltration**
milk, polymers to clean
ultrafiltration membrane fouled
with 120
- Urophycis chuss**
see Hake
- Vegetable**
dimethoate detn. in vegetable 67
insecticide residue in vegetable
83
- Velocity**
food particle suspensions in
holding tube flow, velocity
distribution of 13
- Waste water**
purification process for wine
distillery waste water 200
- Water**
cake mixes, water vapour sorption
isotherms of 106
fruit, water sorption isotherm of
dried 81
starch/sucrose system, water
mobility in 99
- Water activity**
electric hygrometer & measurement
of water activity 17
- Water-binding capacity**
cod fillet, bicarbonate &
water-binding capacity
improvement in 191
- Wheat**
chlorpyrifos-methyl residue in
stored wheat 43
milling hard amber durum wheat
for semolina/flour 45
non-edible oil as grain
protectant in wheat 207
storage period & insect effect on
wheat 44
- Wheat flour**
milling hard amber durum wheat
for flour 45
- Whey**
concn./drying of whey 143
solid state sulfitolysis &
protein recovery from raw sweet
whey 144
thin film scraped surface heat
exchanger & heat transfer during
concn. of whey 9
- Wine**
red wine, polysaccharide &
cross-flow microfiltration of 199
waste water, purification process
for wine distillery 200
- Withania coagulans**
protease from Withania coagulans
23
- Zearalenone**
Fusarium, zearalenone producing

strain of 248
Zinc

food colourant, zinc corrosion &
citric acid containing 2

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